Role of occlusal wear on periodontal status- A Cross Sectional

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Abstract

Background: Occlusal wear that occur with dental, periodontal and joint problems is the loss of tooth structure by physical or chemical process in the absence of bacteria.Literature has extensively discussed regarding the possible relationship between occlusal and periodontal conditions. Various studies were directed to obtain association between periodontal disease and tooth wear but the results were scarce, so thisstudy was aimed to determine any probablelink between attrition and periodontal disease.
Methods: A total of sixty-five subjects between age 25- 75years were included in the study. Gingival inflammation, oral hygiene index, attrition grading and probing pocket depth were measured and recorded for each subject. The data was then statistically analysed using un-paired t test, chis-square test and pearson's correlation for all parameters.
Results: Astatistical significance association between attrition grading, probing pocket depth, oral hygiene score, and gingival inflammation was seen on comparison with no association.

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Conclusion: Within restrictions of the study, though there was a decrease in periodontal destruction with increase in amount of attrition. There was no association between occlusal wear and periodontal status. Maxillary and Mandibular molars were most affected teeth regarding attrition whereas maxillary molars had higher amounts of pocket depths. Maxillary incisors were least affected for both attrition and pocket depths.

Key Words:-Attrition**;**Occlusal Wear**;** Periodontal Diseases; Tooth Wear

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INTRODUCTION

Toothwear is the loss of tooth substance by means other than dental caries [1, 2]. They may be of several types like attrition, abrasion, erosion, abfraction etc.It is well known that its occurrence factors are multiple. Advancement inthe way of life style and change in regular food habits are the factors that are accountable for tooth wear [3].Chewing of hard foods, tobacco chewing, intake of acidic beverages, nail biting, abnormal masticatory activity are some other additional factors that are also responsible for tooth wear [4]. There is a difference of opinion regarding tooth wear and periodontal breakdown among various authors.

Oral hygiene is the level of maintenance of dental health in an individual. The appropriate oral hygiene care depends mainly on the efficacy of oral self-care which includes the use of tooth brushes, dental flosses and other cleansing aids. However, improper usage of these self-care methods can lead to wearing oftooth [5].Reduced oral hygiene causes more build-up of plaque and calculus that cause periodontal problems.These conditions show their direct or indirect effects on periodontal tissues i.e., decreased capacity of teeth to bear masticatory forces due to tooth wear [6]. These cumulative effectsof plaque and calculus on occlusal trauma leads to greater periodontal breakdown, causing periodontitis [7].

Attrition is a loss of tooth surface (enamel and dentin) with direct teeth contact due to normal or abnormal masticatory activity in the absence of bacteria [8].Karolyi *et al.*[9] had postulated that masticatory muscles hyperactivity might be an etiological factor for periodontal disease (Pyorrheaalveolaris). Several other studies demonstrated the deleterious effects of bruxism (severe form of attrition) on periodontium [10, 11]. In addition to this, epidemiological studies done byAinamo*et al.*[12] andLahdenpaa*et al.*[13] stated that patients with pronounced occlusal wear did not exhibit more gingivitis, deeper periodontal pockets or greater loss of attachment than individuals without attrition and indicated a correlation regarding occlusal wear and periodontal disease

Recent periodontal literature suggest that excessive occlusal forces did not cause long standing damage to healthy periodontium thus questioning the existence of pure primary trauma [14, 15].Though, the presence of bacterial plaque (a co-factor) is considered as a pre-requisite for the onset of periodontal disease, the role of occlusal wear to cause periodontal disease looks to be inconclusive in the writings according to some authors [16].

Theoretically, trauma to periodontium may also be due to excessive occlusal forces exerted during bruxism (severe form of attrition), but it seems that such difference between trauma from occlusal wear in the natural environment and experimental trauma from artificial experiments has not been clearly demonstrated [17].Therefore, due to prevailing controversies in this field, the present study was designed with the aim to define possible association between attrition and periodontal disease.

MATERIALS AND METHOD

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A cross-sectional study was conducted to determine an association between attrition and periodontal disease. The data was obtained from the outpatient department (O.P.D.) of Periodontology. A total of 65 patients, both male and female aged 25- 75years were included in the study.

Inclusion criteria:

- Subjects with age 25-75 years.
- Subjects having ≥ 20 teeth.
- Subjects with gingivitis/ periodontitis (>3mm Pocket Depth) along with attrition.
- Systemically healthy (≤3mm Pocket Depths) subjects.

Exclusion criteria:

- Lactating and Pregnant females.
- Subjects who had undergone periodontal treatment within last 6 months.
- Subjects suffering from medically compromised conditions.
- Subjects not willing to sign the consent.

Study Design:

A cross-sectional study which included 65 patients, both male and female, aged 25-75yearswas conducted in the Department of Periodontology to determine an association between attrition and periodontal disease.

The Ethical clearance was obtained from the Institutional Ethical Committee (IDS/ETHCC/18/42). A written informed consent was obtained from the subjects or their attendees before carrying out the study, which was in accordance with the World Medical Association's Declaration of Helsinki [18].

Sample size calculation:

The sample size was calculated using G-power 3.1.9.2 software and the alpha value was kept at 5% whereas power of the study was chosen to be 80%, hence the sample size was determined as 36.For better outcome of the results, the sample size taken was 65 out of which 44 were males and 21 were females.

Method of Collection of Data:

A total of 65 subjects were randomly selected from the O.P.D. of Periodontology department as per the inclusion criteria. The included patients were clinically assessed according to four parameters i.e. gingival inflammation (GI) assessed dichotomously (present or absent) based on Ainamo and Bay 1975 [19], oral hygiene index simplified for assessing oral hygiene status (OHS)[20], probing pocket depth (PD)measured by using a UNC- 15 probe at 6 sites on each tooth, worst pocket score was taken as PD for that particular toothand attrition grading (AG) for assessing tooth wear, the teeth from 65 patients were classified into mild attrition (score 0,1), moderate attrition (score 2, 3) and severe attrition (score 4) based on attrition grading index given by Smith and Knight[21] which is as follows;

- Score 0 – no loss of enamel surface features on buccal/lingual/occlusal/incisal (B/L/O/I) and no change in contour on cervical region (C).
- Score 1 – loss of enamel surface features on B/L/O/I and minimal loss of contour on C.
- Score 2 – loss of enamel exposing the dentine for less than 1/3 of the surface on B/L/O/I and defect less than 1 mm deep on C.
- Score 3 – loss of enamel exposing the dentine for more than 1/3 of the surface on B/L/O/I and defect 1-2 mm deep on C.
- Score 4 – complete loss of enamel or pulp exposure on B/L/O/I and defect more than 2 mm deep on C.

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The data of clinical parameters of all subjects was collected.

Statistical Analysis:

The collected data was statistically analyzed by SPSS version 22 (IBM,USA) and p-value $\leq$ 0.05 were considered statistically significant. Unpaired t test was done to define significance between OHS, PD, and AG. Chi-square test was performed to determine association between Attrition Grading and Gingival Inflammation; and also to find out association between Pocket Depth and Attrition grading. The correlation between AG, PPD, OHS was found using Pearson's Correlation test.

RESULTS

65 subjects randomly selected were included in the study and were clinically evaluated for oral hygiene score, gingival inflammation, pocket depth and attrition grades to determine an association between attrition and periodontal disease

The overall mean scores for OHS, AG and PD were2.67 ± 1.18, 3.28 ± 1.27 and 2.06 ± 0.96 respectively as shown in Table 1.

In Table 2, attrition grading was compared to pocket depth and oral hygiene score (status) individually. The values were statistically significant indicating an association between them. With AG a weak positive correlation is obtained with OHS, whereas PD showed a weak negative correlation.

The mean scores of maxilla and mandible for AG, PD are 3.18 ± 1.37, 2.04 ± 0.95 and 3.23 ± 1.26, 2.02 ± 0.93, respectively (Table 3).

Table 4 shows the comparison and correlation scores between Attrition Grading, Pocket Depth and Gingival Inflammation of maxilla and mandible and the values were statistically significant. In this also,a weak negative correlation was obtained between AG and PD while positive correlation was obtained in other combinations like PD with OHS and OHS with AG.

In Table 5 and 6, gingival inflammation was depicted as Bleeding on Probing present or absent and Pocket Depths were categorized into ≤ 3mm and > 3mm; respectively. They were compared individually with Attrition Grading for finding association between them. There was a significant association between gingival inflammation and attrition grading (mild, moderate and severe). 27.6% showed bleeding on probing and 33.12% showed absence of bleeding on probing regarding severe attrition. When attrition grading was compared with pocket depths, values were not statistical significant regarding mild attrition and statistical significance was obtained with moderate and severe attrition. When these parameters were compared at once, values were statistical significant. In severe attrition, 55.78% showed healthy pockets depths (≤ 3mm) and only 5% showed deeper pockets (> 3mm). In moderate attrition, higher percentage of deeper pocket depths (> 3mm) (7.9%) were found when compared with mild attrition.

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DISCUSSION

The relation between the occlusal wear and periodontal disease (initiation and progression) is quite controversial. In the present study 15.4% showed good oral hygiene which is comparable to other studies conducted by Umoh A O *et al.*[5] and Zinser A *et al.*[22] where they had 21.5% and 18% good oral hygiene correspondingly. This variation was mainly due to change in food habits, race, and geographical discrepancy. Thus, good oral hygiene cannot be appreciated in all the people. This study also accounts for 49.2% fair oral hygiene and 35.4% poor oral hygiene. This percentage was relatively higher in poor oral hygiene and fair oral hygiene percentage was lesser when compared to study conducted by Umoh A O *et al*.[5], Jain M *et al.*[23] where it was 15.4%, 63.1% and 24.4%, 70% indicating insufficient oral hygiene maintenance among people.

The present study is in harmony with the study conducted by Umoh A O *et al.*[5]; Shefter*et al.*[24] where severe tooth wear lesions showed poorer periodontal status and there was an statistical significance with oral hygiene score. This can be clarified by some mechanisms like release of endotoxins, endotoxins, some enzymes, metabolic products, hypersensitivity reactions, and some complement actions that cause poorer oral hygiene status. Moreover with increase in plaque accumulation more inflammation is elicited, leading to periodontal disease [25].

Table 3 shows the mean scores of AG and PD of maxilla and mandible individually. In this OHIS is not considered as it cannot be used individually and values determine the complete oral health status. In table 4 when attrition grading was compared with pocket depth, though the values were highly statistically significant but there was a weak negative correlation between them. This might be due to smaller sample size and the parameters considerations in the study When gingival inflammation was compared with pocket depth values were significant representing that reduced (poor) oral hygiene (weak positive correlation) cause more build-up of plaque and calculus in turn leading to more gingival inflammation ultimately leading to gingivitis or periodontitis. This can also be explained by term 'hyper function' have shown stimulatory and constructive effects on periodontium [12].

In table 5, severe attrition has higher percentages of absence of bleeding on probing indicating that with increased severity of attrition, gingival health is improved. There is even presence of lesser percentages of bleeding on probing but the values were statistically significant. Bleeding was mainly due to poor oral hygiene and some other abnormal habits causing more accumulation of deposits at gingival tooth interface as calculus and plaque formation are non- stoppable. Present study is in accordance with the previous studies that were conducted in literature [Alexander *et al.*[26] and Parfitt *et al.*[27] where the authors have concluded that more gingivitis and deposits (plaque and calculus) were seen in non-functional quadrants rather than functional quadrants in the oral cavity. Lesser subgingival calculus accumulation is seen in areas of attrition than in areas without attrition.

In table 6 when attrition was compared with pocket depths severe attrition has highest percentage of healthy periodontium (≤ 3mm PD) i.e.; 55.78% and only 5% of deeper pockets (> 3mm) were found thus confirming that with increase amount of attrition there is a decrease in periodontal destruction. Present study is in agreement with Hanamura*et al.*[28] study, where they stated that bruxism (severe form of attrition) patients exhibited no or minimal signs of periodontal destruction

This can be explained in part by recent neurophysiologic studies that reinforced the

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important role of periodontal mechanoreceptors in masticatory function and dysfunction. If periodontal disease affects this feedback mechanism it seems logical that periodontal tissue loss would result in lesser occlusal forces and probably less attrition representing a possible handicap of periodontal mechanoreceptor function [28].

In the present study, with increase in attrition there was refinement in periodontal condition which is in accordance with the previous study conducted by OzcanE*et al.*[29] where the authors have assessed alveolar bone height (ABH) and alveolar bone density (ABD) radiographically. They have concluded that as tooth wear increases there was improvement in ABH and ABD. This might be due to the constant remodeling happening in the alveolar bone helps in maintaining the alveolar crestal levels that in turn maintains a constant attachment apparatus.

Coming to individual teeth, maxillary and mandibular molars are equally showed higher percentages of attrition (60%) but maxillary molars have shown higher percentages of pocket depths (19%). This is in accordance with the study conducted by Ainamo*et al.*[12] where maxillary molars have greater tendency to bone loss and attrition. Present study also reveals that maxillary incisors are least affected with attrition and pocket depths this is mainly due to proper cleansing measures and lesser accumulation of plaque and calculus. This is opposite to the study done by Ainamo*et al.*[12] where there was decreased periodontal breakdown in maxillary anteriors with increasing attrition.

Mandibular canines, mandibular premolars, mandibular incisors and maxillary premolars are almost equally affected regarding severity of attrition this is similar to Ainamo*et al.*[12] study regarding the mandibular premolars where there was decreased periodontal destruction. This may be due to abnormal tooth cleaning techniques, consumption of coarse diet and personal habits like chewing tobacco, especially in males. In addition to this, according to Shore, during swallowing, teeth contact occurs around 1500 times. These cyclic and repetitive loads on occlusal surface cause the major wear of tooth thus causing attrition [30].

Present study is also in harmony with a previous study conducted by Pikdoken L *et al.*[31] where they studied periodontal condition with cervical tooth wear, occlusal wear and established that with increase in cervical wear there was decrease in pocket depths and occlusal wear didn't show any relation to cervical wear. Whereas present study considered occlusal wear compared with pocket depths and achieved similar results.

Limitations of the present study were smaller sample size, separate periodontitis group as standard control was not considered, and Alveolar crest levels were not taken into account through intra oral peri-apical radiographs. Advanced bite force and muscle stiffness measurement values were not taken which might help in eliminating bruxism cases. Interventional studies with larger sample size would give better outcome of results.

CONCLUSION

Within the boundaries of the present study it can be determined that with increase in amount of attrition there is a decrease in periodontal destruction and a significant association was obtained between the parameters like oral hygiene status, gingival inflammation, pocket depths and attrition. Even though the associationwas obtained, but it was a weak making the conclusions controversial. Further larger sample size studies are mandatory for better results. Regarding individual teeth, molar (maxillary and mandibular) teeth are the maximumeffected and maxillary incisors are least effected with attrition. The pocket depths

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in maxillary molars are most effected and maxillary incisors were least affected.

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Table 1: Overall mean values of Oral Hygiene Score, Attrition Grading and Pocket Depth.

Parameters	Mean ± SD
Oral Hygiene Score	2.67 ± 1.18
Attrition Grading	3.28 ± 1.27
Pocket Depth	2.06 ± 0.96

SD means Standard Deviation

Table 2: Comparison and Correlation valuesbetween Attrition Grading, Pocket Depth and Oral Hygiene Scores.

Parameters	t*	p-value	r values
OHS vs AG	1.657	0.0114*	0.054
PD vs AG	1.980	0.0000*	-0.207
OHS vs PD	1.979	0.0017*	0.205

*denotes statistical significance; OHS means Oral hygiene simplified; AG means Attrition grading; PD means Pocket depth; t means Calculated difference; r value means Correlation Coefficient; p means level of significanceand p-value $\leq$ 0.05 were considered statistically significant.

Table 3: Overall mean values for Maxilla and Mandible.

Maxilla	Mean ± SD	Mandible	Mean ± SD
Attrition Grading	3.18 ± 1.37	Attrition Grading	3.23 ± 1.26
Pocket Depth	2.04 ± 0.95	Pocket Depth	2.02 ± 0.93

SD means Standard Deviation

Table- 4:Comparison and Correlation values between Gingival Inflammation, Attrition Grading, Pocket Depth of Maxilla and Mandible.

Maxilla	t*	p-value	r- value	Mandible	t*	p-value	r-value
AG vs PD	1.981	0.00000*	-0.251	AG vs PD	1.980	0.000*	-0.2017
GI vs PD	1.985	0.00059*	0.323	GI vs PD	1.985	0.002*	0.3816

*denotes statistical significance; GI means Gingival inflammation; AG means Attrition grading; PD means Pocket depth; t means Calculated difference; r value means Correlation Coefficient; p means level of significanceand p-value $\leq$ 0.05 were considered statistically significant.

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Table 5: Comparison between Attrition Grading and Gingival Inflammation.

Attrition	GI present	GI absent	Individual p-value	Overall p-value
Mild	246 (12.69%)	97 (5%)	0.000000*	
Moderate	332 (17.1%)	85 (4.3%)	0.000000*	
Severe	536 (27.6%)	642 (33.12%)	0.000000*	0.00000000*

*denotes statistical significance; p means level of significanceand p-value ≤ 0.05 were considered statistically significant.

Table6: Comparison between Attrition Grading and Pocket Depth.

Attrition	PD ≤3	PD >3	Individual p-value	Overall p-value
Mild	276 (14.2%)	67 (3.4%)	0.111731	
Moderate	264 (13.6%)	153 (7.9%)	0.000000*	
Severe	1081 (55.78%)	97 (5%)	0.000000*	0.000000*

*denotes statistical significance;PD means Pocket depth; p means level of significanceand p-value ≤ 0.05 were considered statistically significant.

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