ORIGINAL ARTICLE

FREQUENCY AND ETIOLOGICAL FACTORS OF NON CARIOUS CERVICAL LESIONS

[1]FARAH MUSHTAQ
[2]MANZOOR AHMED

ABSTRACT

The objective of this study was to estimate the level and frequency of non carious cervical lesion with in patient's dentition reporting with this condition and to investigate factors that might played frequent role in its etiology. Targeting these factors and severity levels, an accurate treatment modalities can be designed. This descriptive cross sectional study was conducted at Outpatient Department Of Operative Dentistry Rawal Institute Of Health Sciences, Islamabad from 1st October to 31st November 2015.Data was collected through consecutive sampling. A total of 70 patients, including 27(38.6%) males and 43(61.4%) females with a mean age of 44.2±12.8 were examined for non carious cervical lesion's level of severity and data was recorded about oral health conditions and dietary habits after approval of study by ethical committee of Rawal Institute Of Health Sciences and patients informed consent. Data was analyzed by SPSS version 23.0.Right mandibular lateral incisor was the most common and severely affected tooth with mean tooth wear index(1.70±1.22). Anterior teeth affected more(7.14±2.50)as compared to posteriors(1.50±2.06).Mandibular teeth(10.67±5.37) affected more as compared to maxillary teeth(3.64±1.93). Age seemed to play no role according to study statistics. Highest frequency among variables was of tooth sensitivity n=56 (82.9%) in reported teeth with cervical lesions. A significant difference between participants using different types of tooth brushes was reported p 0.05.All other variables were statistically insignificant with no obvious contribution.

Key Words: *Tooth wear, Tooth abrasion, Tooth attrition, Tooth erosion.*

INTRODUCTION

Oral cavity disease and their etiology involve multiple array of enviornmental,genetic, immunologic and socio-behavorial factors including oral health awareness, oral hygiene habits and access to dental care. Tooth wear is among the oral conditions which is dependent on these factors. A non carious cervical lesion is a non carious tooth wear with a wide variety of size, shape, symmetry, and location from shallow depression to broad disk shaped lesion to wedge shaped defects with flat or sharply angled floor.[1,2,3,4,5,16] It can cause pain and esthetic implications.[20] Usually bucco cervical region are most vulnerable and affected hard tissues involve enamel and dentin ,or cementum. Clinical studies and observations have shown that cervical lesions are often situated on vestibular surfaces of teeth, seldom on lingual surfaces and rarely on proximal surfaces. They are also more pronounced on incisors, canines, and premolars.[1,5,18]A systemic review in adults reported increase of non carious cervical lesions with age but there was inadequate data to show whether presence is due to specific factors or just normal aging process.[6,7,8,9,13]

Since the dawn of modern dentistry, etiology of non carious cervical lesions has been ascribed by some dentist to single factor like abrasion alone.[3] Multifactorial interactions are involved in its development including conditions of erosion or biocorrosion, abfraction, abrasion process. Potentiation of abrasion by erosive damage to the dental hard tissues seems to be the major factor in occlusal and cervical wear.[1,2,7,10,12,14] Spranger and colleagues described the condition of cervical lesion as multifactorial event including stress, biocorrosion and friction.[3] It was suggested that magnitude, frequency, site of application and duration of forces determine the nature and extent of Non carious cervical lesion. Non carious cervical lesions are often mentioned as patients main complaint due to discomfort and sensitivity.[11,12,17]

Grippo defined four categories of tooth wear.These four categories of make the tooth prone to non carious cervical lesion and hence included in the etiological factors[5,11,15]Attrition is defined as loss of tooth substance as a result of tooth to tooth contact during normal or parafunctional masticator activity, it can be due to

[1] Dr Farah Mushtaq, FCPS-II Resident Operative Dentistry, Rawal Institute. **Postal address:** House No 1220, Street-10, Sector I-10/2, Islamabad Cell: 0333-538-3747
Email: noble_career@hotmail.com
[2] Prof, Brig (R) Manzoor Ahmed

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unbalanced occlusion, jaw clenching or bruxism. Abrasion is a pathological wear of tooth substance through biomechanical frictional process e.g tooth brushing its force, frequency, type of tooth brush. Erosion is a loss of tooth substance by acid dissolution either intrinsic or extrinsic origin for example gastric acid or dietry acid and frequency of soft drinks intake. Abfraction is pathologic loss of tooth substance caused by biomechanical loading forces. Tooth flexure cause these lesions. Non uniform loading of maxillary and mandibular arches due to crowding, premature contacts or prominance of tooth can be of hairline, cracks, straitions, saucer shaped or semilunar shapes. Mostly occlusal stess is common to all conditions as primary factor in non carious cervical lesion condition.

In order to determine the severity,location of affected teeth with non carious cervical lesions, various indices are formed for it. Previous studies have concentrated on one etiologic factor and indices involved were surface limited, lacking uniformity with non carious cervical lesions.[5]This study utilized the Smith and Knight index[2] which is clinically more relevant to know about non carious cervical lesions and its severity level.Knowing the extent of lesion, age groups, frequent arches and teeth affected and various risk factor in causing this condition which might be part of its multifactorial etiology will provide the clinicians a reasonable ground to include tooth wear indices to wider clinical practice and targeting factors for specific preventive strategies to prevent disease progression, early diagnosis and effective restorative treatment which is the rationale of the study.

METHODOLOGY

This descriptive cross sectional study enrolled total of 70 out patients with anterior and posterior permanent teeth after approval of the study by ethical committee of Rawal Institute Of Health Sciences. (Annexure-I) Sample size was calculated using World Health Organization sample size calculator with confidence interval=95%. Anticipated population proportion 76.84%[1], Absolute precision required=70%, Minimum sample size=70. The study duration was from 1st October 2015 to 31st November 2015. The patients meeting the inclusion criteria which was patients of both genders between age group 21-80, presenting with wedge shaped lesions shallow or deep at cervical enamel, non carious lesion, having history of aggressive tooth brushing and usual diet of acidic and hard food intake, who did not wear any dentures and did not undergo any bleaching procedures in past who reported to rawal institute of health sciences operative department were included in the study while the patients who had active systemic disease, who did not provide consent,who had crown and bridge supported teeth,carious and abnormal anatomical teeth were excluded from the study. After written informed consent of patients aims and objectives of the study were explained to them.Questionnaire were designed on presence and extent of non-carious cervical lesions with index,tooth effected and its probable causative factors. In order to avoid interviewer bias the single trainee researcher performed data collection and clinical examination. After demographics and history taking, subjects teeth were clinically examined for cervical irregularities with community periodontal index probe and mouth mirror and evaluated for non carious cervical lesions with help of Smith and Knight tooth wear index where 0=no change,1=Minimal loss of contour, 2=defect< 1mm in depth, 3=defect 1-2mm in depth and 4=defect> 2mm in depth or pulp exposure or exposure of secondary dentin and their score recorded, examined for tooth sensitivity, fractured and flat cusps, cusp facets and were asked about brushing frequency, type of tooth brush, Acidic And Citrus Fruit Intake, Gastric disorder/acidity, Stress disorder, Jaw clenching, Pan chalia chewing, teeth grinding and all data was recorded.

Data was entered and analyzed using the Statistical Package for Social Sciences v 23.0 (IBM Statistics, Chicago, Ill). Mean non carious cervical lesions wear index were calculated for all anterior and posterior teeth in both mandibular and maxillary arches of patients respectively Frequencies and percentages were described for age; gender; patient's characteristics; social habits; non carious cervical lesions frequencies and tooth wear index for all teeth. Independent sample T-test was used to compare the mean non carious cervical lesions values for all dichotomous variables (gender, tooth sensitivity, fractured cusp, flat cusps/ cusp facets, gastric disorder/acidity, stress disorder, pan chalia/ chewing, teeth grinding, tooth position and tooth arch). For all variables with more than two sub- categories, one-way ANOVA was used to compare the mean non carious cervical lesions values (brushing frequency, types of tooth brush, acid and citrus fruit intake, and age groups). For those variables for which ANOVA reported a significant result, Turkey post-hoc analysis was performed to analyze any inter-group differences. An arbitrary value of 0.05 was considered to be statistically significant.

RESULTS

A total data of 70 patients, 27 males (38.6%) and 43 females (61.4%) was collected (Table 1).The mean age of the patients was reported to be 44.2 ± 12.8. Overall frequency distribution is shown in Table-1. Highest frequency among variables was of tooth sensitivity n=56(82.9%) in reported teeth of non carious cervical lesions A significant difference between participants using different types of tooth brushes was reported ($p<0.05$).All other variables were insignificant. Anterior teeth and mandibular arch with p value of 0.01 were statistically significant with non carious cervical lesions (Table- 2). Mean NCCL teeth were reported to be 9.3 ± 3.3.The right mandibular lateral incisor was found to have the highest frequency (n=56, 80.0%) as well as the greatest severity (Mean tooth wear index = 1.70 ± 1.22) of NCCL. (Fig 1, Fig 2) (Table 3)

TABLE 1: FREQUENCIES, PERCENTAGES, MEAN, STANDARD DEVIATION AND P-VALUES FOR PATIENT PARAMETERS

Variable		Frequency(%)	Mean NCCL (standard deviation)	P – value
Gender	Male	27 (38.6%)	8.59 (3.19)	> 0.05
	Female	43 (61.4%)	7.58 (2.74)	
Tooth Sensitivity	Present	58 (82.9%)	8.21 (2.88)	> 0.05
	Absent	12 (17.1%)	6.83 (3.10)	
Fractured Cusp	Present	37 (52.9%)	8.14 (2.56)	> 0.05
	Absent	33 (57.1%)	7.79 (3.34)	
Brushing Frequency	No Brushing	10 (14.3%)	9.60 (2.63)	> 0.05
	Once Daily	28 (40.0%)	8.11 (3.37)	
	Twice Daily	28 (40.0%)	7.46 (2.55)	
	Thrice Daily	4 (5.7%)	6.50 (1.73)	
Type of Tooth Brush	No Brush	10 (14.3%)	9.60 (2.63)	< 0.05
	Soft	17 (24.3%)	7.00 (3.24)	
	Moderate	23 (31.4%)	9.14 (2.48)	
	Hard	21 (30.0%)	7.70 (2.92)	
Flat Cusps/Cusp Facets	Present	40 (57.1%)	8.33 (2.81)	> 0.05
	Absent	30 (42.9%)	7.50 (3.09)	
Acid and Citrus Fruit Intake (n = 69)	Several Times a Week	12 (17.4%)	7.17 (2.48)	> 0.05
	Once a Week	19 (27.5%)	8.42 (2.93)	
	Several Times a Month	10 (14.5%)	7.50 (2.01)	
	Seldom/Never	28 (40.6%)	7.93 (3.19)	
Gastric Disorder/ Acidity (n = 69)	Present	40 (58.0%)	8.03 (2.79)	> 0.05
	Absent	29 (42.0%)	7.66 (2.93)	
Stress Disorder (n = 69)	Present	17 (24.6%)	7.82 (2.68)	> 0.05
	Absent	52 (75.4%)	7.88 (2.91)	
Jaw Clenching (n = 69)	Present	9 (13.0%)	8.11 (2.67)	> 0.05
	Absent	60 (87.0%)	7.83 (2.88)	
Pan/ Chalia Chewing (n = 69)	Present	10 (14.5%)	7.90 (2.23)	> 0.05
	Absent	59 (85.5%)	7.86 (2.94)	
Teeth Grinding (n = 69)	Present	17 (24.6%)	8.18 (2.60)	> 0.05
	Absent	52 (75.4%)	7.77 (2.92)	

The NCCL frequencies, mean values and p-values for the statistical analysis performed for the various patient parameters have been illustrated in Tables 1 and 2.

The frequencies and percentages of the Tooth wear index value for each tooth have been shown in Table 3.

DISCUSSION

The results of present study demonstrates that no method is ideal and absolutely accurate but use of questionnaires by asking subjects to record their dietary and oral habits gives better understanding to patient and ease of examination and reading to clinicians compared to previous studies on tooth wear.[6] However self reported questionnaires might not be an ideal method

TABLE 2: MEAN,STANDARD DEVIATION AND P-VALUES FOR TOOTH WEAR INDEX WITH RESPECT TO TOOTH POSITION, ARCHES AND AGE GROUPS.

Location		Mean NCCL (Standard Deviation)	P – Value
Tooth Position	Anterior	7.14 (2.50)	< 0.01
	Posterior	1.50 (2.06)	
Arch	Maxillary	3.64 (1.93)	< 0.01
	Mandibular	10.67 (5.37)	
Age Groups	21-30 Years	7.23 (2.65)	
	31-40 Years	7.69 (2.66)	
	41-50 Years	8.38 (3.71)	> 0.05
	51-60 Years	8.40 (1.65)	
	61-70 Years	7.75 (2.49)	

TABLE3: DESCRIPTIVE STATISTICS FOR CODES OF TOOTH WEAR INDEX WITH RESPECT TO ORIGINAL TEETH.

Tooth	Code 0	Code 1	Code 2	Code 3	Code 4	Mean (Standard Deviation)
Left Maxillary Central Incisor	33 (47.1%)	15 (21.4%)	16 (22.9%)	5 (7.1%)	1 (1.4%)	0.94 (1.06)
Left Maxillary Lateral Incisor	33 (47.1%)	13 (18.6%)	16 (22.9%)	7 (10.0%)	1 (1.4%)	1.00 (1.11)
Left Maxillary Canine	40 (57.1%)	8 (11.4%)	10 (14.3%)	10 (14.3%)	2 (2.9%)	0.94 (1.25)
Left Maxillary First Premolar	61 (87.1%)	3 (4.3%)	5 (7.1%)	0 (0.0%)	1 (1.4%)	0.24 (0.71)
Left Maxillary Second Premolar	61 (87.1%)	5 (7.1%)	3 (4.3%)	0 (0.0%)	1 (1.4%)	0.21 (0.66)
Left Maxillary First Molar	61 (87.1%)	2 (2.9%)	6 (8.6%)	1 (1.4%)	0 (0.0%)	0.24 (0.67
Left Maxillary Second Molar	70 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0.00 (0.00)
Right Maxillary Central Incisor	34 (48.6%)	14 (20.0%)	19 (27.1%)	1 (1.4%)	2 (2.9%)	0.90 (1.04)
Right Maxillary Lateral Incisor	32 (45.7%)	16 (22.9%)	13 (18.6%)	6 (8.6%)	3 (4.3%)	1.03 (1.18)
Right Maxillary Canine	36 (51.4%)	9 (12.9%)	8 (11.4%)	15 (21.4%)	2 (2.9%)	1.11 (1.32)
Right Maxillary First Premolar	62 (88.6%)	3 (4.3%)	5 (7.1%)	0 (0.0%)	0 (0.0%)	0.19 (0.55)
Right Maxillary Second Premolar	63 (90.0%)	3 (4.3%)	3 (4.3%)	1 (1.4%)	0 (0.0%)	0.17 (0.56)
Right Maxillary First Molar	61 (87.1%)	3 (4.3%)	5 (7.1%)	1 (1.4%)	0 (0.0%)	0.23 (0.64)
Right Maxillary Second Molar	70 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0.00 (0.00)
Left Mandibular Central Incisor	22 (31.4%)	13 (18.6%)	23 (32.9%)	7 (10.0%)	5 (7.1%)	1.43 (1.23)

Left Mandibular Lateral Incisor	20 (28.6%)	9 (12.9%)	27 (38.6%)	9 (12.9%)	5 (7.1%)	1.57 (1.23)
Left Mandibular Canine	29 (41.4%)	5 (7.1%)	16 (22.9%)	16 (22.9%)	4 (5.7%)	1.44 (1.38)
Left Mandibular First Premolar	63 (90.0%)	3 (4.3%)	3 (4.3%)	1 (1.4%)	0 (0.0%)	0.17 (0.56)
Left Mandibular Second Premolar	64 (91.4%)	3 (4.3%)	2 (2.9%)	0 (0.0%)	1 (1.4%)	0.16 (0.61)
Left Mandibular First Molar	58 (82.9%)	3 (4.3%)	8 (11.4%)	0 (0.0%)	1 (1.4%)	0.33 (0.79)
Left Mandibular Second Molar	68 (97.1%)	0 (0.0%)	2 (2.9%)	0 (0.0%)	0 (0.0%)	0.06 (0.34)
Right Mandibular Central Incisor	20 (28.6%)	16 (22.9%)	20 (28.6%)	8 (11.4%)	6 (8.6%)	1.49 (1.26)
Right Mandibular Lateral Incisor	15 (21.4%)	14 (20.0%)	24 (34.3%)	11 (15.7%)	6 (8.6%)	1.70 (1.22)
Right Mandibular Canine	25 (35.7%)	7 (10.0%)	16 (22.9%)	18 (25.7%)	4 (5.7%)	1.56 (1.36)
Right Mandibular First Premolar	64 (91.4%)	0 (0.0%)	5 (7.1%)	0 (0.0%)	1 (1.4%)	0.20 (0.69)
Right Mandibular Second Premolar	60 (85.7%)	3 (4.3%)	6 (8.6%)	0 (0.0%)	1 (1.4%)	0.27 (0.74)
Right Mandibular First Molar	59 (84.3%)	1 (1.4%)	10 (14.3%)	0 (0.0%)	0 (0.0%)	0.30 (0.71)
Right Mandibular Second Molar	70 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0.00 (0.00)

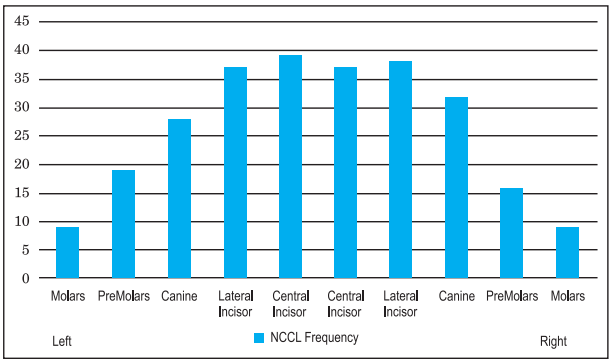

Fig 1: Noncarious cervical lesion frequency among maxillary teeth

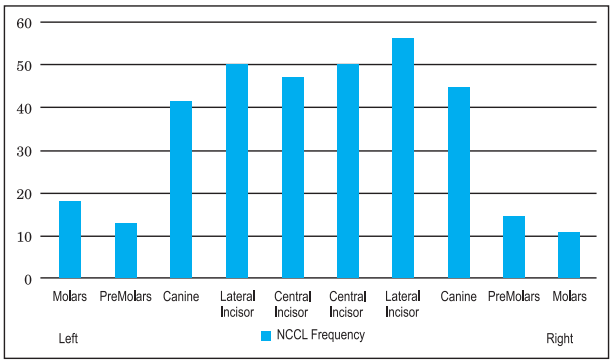

Fig 2: Non carious cervical lesion frequency among mandibular teeth

for data collections as patient oral health awareness can affect quality of answers.[4]

In present study, Smith and Knight index was used in order to measure frequency and severity of non carious cervical lesions.[2] Reliance on indices to estimate frequency of tooth wear in communities under study will get reduced in near future as scanning techniques become faster and more patient friendly and scanners and profilers will supersede indices, other methods recommend study casts along with photographs. Until that happens, the only convenient method to assess non carious cervical lesions is indices.[6]

This study included patients with non carious cervical lesions with reported variables of non carious cervical lesions levels, age, arch involved, most commonly and severely affected teeth and multifactorial etiology. It was found that mean age group with non carious cervical lesions was 44.2±12.8 and extent of lesions was not affected by increase in age. The findings of this study were consistent with findings of Laizi and colleques with non carious cervical lesions more common in middle aged people as compared to older ones.[8] However other studies indicated increase of non carious cervical lesions frequency with age because of the fact that in old people therapeutic and dental prosthesis may cause loss of dental hard tissue and that's why seeking for oral care.[4,5,7,9,13,17] Difference can probably be due to limited sample size, reporting only limited part of local population.

On basis of genders, our study reported non carious cervical lesions to be more common in females 61.4% as compared to males 38.6% with insignificant p-values. This data was supported by Sandeep and colleagues and other studies,[2,6] but inconsistent with results of Ahmed and colleagues with more frequency in males 73% and 23% in females and also second by brandini results.[4,20] This non uniformity might be again because of sample size limitations and narrow spectrum and might be also because females are more concerned about oral hygiene and using more vigorous tooth brushing.

Commonly affected arch according to study was mandibular with anterior teeth(7.14±2.50) more affected as compared to posteriors(1.50± 2.06) Similar trends were present in boliu and co workers study and barllet study with mandibular teeth having more non carious cervical lesions and anterior teeth affected more as compared to posteriors.[6,7] Disagreement in results were found with studies of brandini and colleagues and Afolbi findings with more frequency of non carious cervical lesions in posterior and maxillary arch.[4,16] It might be because more emphasis was given in upper arches as compared to lower arches in those studies. Right mandibular lateral incisors were most commonly and severely affected teeth in our study. It is supported by boiliu work with incisors teeth affected more 87.22% with non carious cervical lesions.[7] Reasons for high degree of wear observed in lateral incisors is because of the fact that they have thinner bones, small size, frequently retained tooth and active role in mastication and incisal plane guidance movements.[7] Other studies showed the trend of premolars to be most severely and commonly affected,[9,13,16] which does not match our results because of above reasons.

As we included patients with non carious cervical lesions in present study, we tried to figure out various contributing factors in its multifactorial etiology (abrasion, erosion, attrition, abfraction) and reported their frequencies. Oral and dietary contributing factors were considered where as Bomfim and colleagues considered several aspects in the development of non carious cervical lesions which involve decrease pH, food consumption, regurgitation, occlusal stress and friction.[1]

In terms of sensitivity current study reported it as present in 82.9% patients which matches sandeep and co-workers results who reported that non carious cervical lesions progression causes tooth sensitivity and discomfort which prompt patient to seek dental care.[2] Dure Sadaf and colleagues reported 84.6% patient with non carious cervical lesion to have sensitivity.[15] whereas Ahmed and colleagues reported no sensitivity in 74.7% of patients having non carious cervical lesions.[20] However apart from these studies perception of pain and sensitivity among patient varies so they might responded differently to questions.

Fractured cusp can act as contributory factor to non carious cervical lesions because of non uniform occlusion it may cause shortening of teeth, lack of incisal guidance, exposure of pulps and can cause attrition which can contribute further to cervical lesions.[7] Present study showed 57.1% cusps faces or flat/fractured cusps which might lead to attrition.[3] Dure sadaf and colleagues showed non carious cervical lesion to be insignificant with cusp facets.[15] Present study just checked the presence or absence of cusp facets and did not underwent individual tooth analysis for cusp facets.

In this study twice daily brushing and use of moderate tooth brushes were reported more. Mean non carious cervical lesion in case of brushing frequency was insignificant but type of brush was significant(p 0.05). These two factors are causes of abrasion which play role in forming non carious cervical lesions. Our study show similar trends as reported by Ahmed and Dure sadaf and colleagues having twice a day brushing (45.3%) with moderate type of brush(48.4%)[20] and dissimilar trends with Jiang and colleagues findings.[9] Dure sadaf reported patients who brush twice have more non carious cervical lesions. Hard brush is incapable of abrading but may produce surface roughness, indirectly supporting the concept of abrasive lesions in tooth wear.[15]

Dietary habits related to acidic drinks intake and gastric disorder presence were recorded in present study too to rule out any role of erosion or biocorrosion phenomena which is also one of the etiological factors of cervical lesions. Both questions data which was recorded showed these to be insignificant. Several studies reported citric acid intake people had greater tendency of non carious cervical lesions and was also related with heart burn and gastric disorders.[2,7] However it is the frequency of consumption of these acid food, which is more important in terms of tooth wear.[6] Parafunctional habits due to stress/ physiological disorder, teeth grinding, jaw clenching frequencies were reported in our study, as stress and friction might be cause of uneven loads to dentitions and attrition and abfraction. Again because of narrow spectrum addressing only specific locality these factors were statistically insignificant. However reported bruxism by previous studies was 40.9% in patients with cervical lesions. Abnormal clenching and grinding habits produced wear patterns with muscular hypertrophy in one study with bruxers having four times more chance of cervical lesions as compared to non bruxers.[7] Recent studies support the concept of abfractions having maximum stress concentration in cervical area due to tooth flexure.[3]

Further studies with large sample size are necessary before generalization of results is done. Hence affected policy needed to be drafted to improve oral hygiene awareness in population. Government and nonprofit organization should provide funds to provide dental checkups and restore teeth with improve awareness for health

CONCLUSIONS

With the limitations of this study,the provided data with tooth wear index on extent of non carious cervical lesions frequently reported more in females with age being non contributory factor and mandibular anterior arch with right lateral incisors reported as more commonly and severely affected. Frequency of dietary intake and moderate tooth brushing may or may not contribute to multifactorial etiology of non carious cervical lesion. Further studies are suggested for researching on tooth positional prominence and interactive synergy of various factors like stress, friction and biocorrosion to identify complex etiology of these non carious cervical lesions.

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CONTRIBUTIONS BY AUTHORS

1 Farah Mushtaq: Principal Author.

2 Manzoor Ahmad: Supervisor.