The Relation Between Non-Carious Cervical Lesions and Possible Etiological Factors – A Study from a Tertiary Care Setting of Pakistan

Mafaza Alam, Syed Muzammil Hussain Shah, Laima Alam*, Pir Jawad Ali Shah, Afshan Bibi

Armed Forces Institute of Dentistry/National University of Medical Sciences (NUMS) Rawalpindi Pakistan, *Pak Emirates Military Hospital/ National University of Medical Sciences (NUMS) Rawalpindi Pakistan

ABSTRACT

Objective: To investigate and compare the risk factors of Non carious cervical lesions in relation to demographics, dietary, social and hygiene maintaining habits in Pakistani population presenting to Armed Forces Institute of Dentistry Rawalpindi.
Study Design: Cross sectional analytical study.
Place and Duration of Study: Department of Operative Dentistry, Armed Forces Institute of Dentistry, Rawalpindi Pakistan, from Dec 2018 to May 2019.
Methodology: Two hundred patients of both genders ranging from age 12 to 70 years with a mean age of 46.4 ± 12.4 were studied for Non carious cervical lesions presence on convenience sampling technique. Questionnaires regarding their diet, acidic food consumption, social habits, frequency and pattern of brushing were being filled. Chi square statistics were used to compare groups and results were noted.
Results: Old age (55.4 ± 0.8 years), vegetarian diet ($p \leq 0.001$), consumption of acid foods ($p \leq 0.001$), bruxism ($p \leq 0.001$), harder tooth brushes ($p \leq 0.001$) with variable movements ($p \leq 0.001$) showed higher incidence of non-carious cervical lesions. Whereas use of fluoridated toothpastes ($p \leq 0.001$) and xylitol gums ($p = 0.02$) demonstrated protection against the occurrence of these lesions.
Conclusion: The presence of Non carious cervical lesions was linked with the use of harder toothbrushes, variable vigorous pattern for tooth brushing, consumption of a vegetarian diet, and greater consumption of acidic food and bruxism. Effective policies should be developed for oral health and awareness of such conditions.

Keywords: Etiological factors, Non-carious cervical lesions, Risk factors.

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INTRODUCTION

Enamel, being the thinnest at cervical area is susceptible to erosions, abrasions and stress flexure due to the structural fragility. These forces combined can cause breakdown of this delicate portion of enamel causing NCCL. Depending on the degree of severity, these lesions may expose dentine or pulp.[1] Cementum and dentine in bucco-cervical region are the most vulnerable hard tissues of the tooth involved in the destruction after the removal of enamel hence these lesions are referred to as cervical abrasions.[2]

As aesthetics and function can be compromised by the occurrence of NCCL, hence knowledge of their causative factors enhances management of clinical complaints and success of restorative treatments. These lesions may present with mild to severe sensitivity and food stagnation hence causing discomfort to the individuals suffering from them.[3]

The variation in the clinical representation of NCCL depends on the type and magnitude of the causative factors involved several indices have been proposed for determining the development of abfraction defects or NCCL. Smith and Knight used an index with a scale from 0-4 to grade and describe the severity of these defects from normal to the depth as severe as pulp exposure.[4]

NCCL lesion presents with sclerotic dentine that has been physiologically as well as pathologically altered because of body's natural defense mechanism to insult and effects of oral micro flora which renders it a difficult bonding substrate in which failure of restoration retention is very challenging for the dentist. Along with the difficult bonding to the sclerotic dentine of NCCL, the cavity design does not provide adequate retention to the restorative material and the cervical margin being present subgingivally complicates the isolation from saliva, blood and crevicular fluid contamination.[8] Hence, the prevention of their occurrence should be the priority.[6,5] Recent studies showed that when this lesion's dentine is etched, the sclerotic casts dismantling the dentinal tubules and hyper mine-

Correspondence: Dr Mafaza Alam, Resident Operative Dentistry, Armed Forces Institute of Dentistry, Rawalpindi Pakistan
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ralized dentine were still uninterrupted resulting in in appreciable tag formation.The bonding capacity of the present time adhesives to the non-carious cervical lesions with sclerosed dentine was accounted to be less than those attached to self-made cavities created in healthy tooth structure in the same manner.[7,8] This disparity is due to the thin hybrid layers in the former, and the complex structure of the resin-bonded interface. Thus, the restoration of these cavities are difficult and challenging for a dentist.[5,9,10] The objective of our study was to prevent these lesions in the first place instead of treating them due to the high failure rate of their restoration.

METHODOLOGY

This cross-sectional analytical study was carried out at the Department of Operative Dentistry, Armed Forces Institute of Dentistry, Rawalpindi Pakistan, from December 2018 to May 2019. The research was approved by the ethical committee of Armed forces Institute of dentistry under IRB number I/ 71/19. A total sample size of 200 was collected using simple consecutive sampling with a standard error 0.035 and a relative standard error of 7.1 and a confidence level of 95% using National Statistical Services Calculator.[7] An informed consent was taken from all the patients involved in the study.

Inclusion Criteria: Patients with NCCL of both genders, ranging from age 12-70 years who presented to the Out-Patient Department

Exclusion Criteria: Patients with crowned teeth, orthodontic appliances, and heavy calculus covering the cervical regions and teeth with marginal restorations interfering with evaluation were excluded.

In order to collect the information regarding demographics, dietary and social habits and oral hygiene practices, a questionnaire was designed. The risk factors including consumption of acidic foods, frequency and pattern of brushing, use of fluoridated tooth pastes were mentioned and filled duly. For the examination, the patients were asked to sit comfortably on dental unit under adequate light. The instruments used were mouth mirrors, cotton rolls and CPI probes. The probe tip was whipped around the buccal and lingual aspects of maxillary and mandibular teeth to check for the presence of NCCL. Teeth were noted and the questionnaires were filled.

Quantitative data was presented as frequencies and percentages whereas descriptive statistics were used to calculated Mean ± SD of continuous data. Mann Whitney U-test was used to compare quantitative data (age) whereas Chi square test and Fisher's Exact test were used to compare qualitative data. The *p*-value of ≤0.05 was considered significant. Data was analyzed using SPSS version 25.

RESULTS

A total number of 200 patients were enrolled in the study. Out of which 102 were males (51%) and 98 (49%) were females. The patients with NCCL (55.4 ± 0.8 years) were much older as compared to people without any NCCL (37.5 ± 0.8 years) with a significance of <0.001. Bulk of the subjects with an intact surface belonged to a middle socio-economic status i.e. 44 subjects (44%) whereas the majority of subjects i.e. 42 patients with NCCL belonged to a lower socio-economic class (42%) (Table-I).

Table-I: Association of demographic data in patients with NCCL.

Variables	Total n (%)	Non-NCCL (n=100)	NCCL (n=100)	*p*-value
Gender, n (%)				
Male	102 (51)	52 (52)	50 (50)	0.777
Female	98 (49)	48 (48)	50 (50)	
Age (Median with IQR)	45.5 (22)	36 (12)	57 (10)	<0.001
Residence, n (%)				
Rural	2 (1)	2 (2)	0	0.367
Urban	170 (85)	84 (84)	86 (86)	
Both	28 (14)	14 (14)	14 (14)	
Socioeconomic Class, n (%)				
Low	70 (35)	28 (28)	42 (42)	0.111
Middle	78 (39)	44 (44)	34 (34)	
High	52 (26)	28 (28)	24 (24)	

The dietary habits that contributed statistically significant towards the predominance of NCCL were vegetarian diet, consumption of fizzy drinks, citrus fruits and yogurt (Table-II).

Table-II: Association of dietary habits in patients with NCCL.

Variables	Total n (%)	Non-NCCL (n=100)	NCCL (n=100)	*p*-value
Diet				
Vegetarian	74 (37)	22 (22)	52 (52)	<0.001
Mixed	126 (63)	78 (78)	48 (48)	
Citrus Consumption				
None	28 (14)	18 (18)	10 (10)	0.044
Rarely	70 (35)	40 (40)	30 (30)	
Often	102 (51)	42 (42)	60 (60)	
Fizzy Drinks				
None	70 (35)	40 (40)	30 (30)	<0.001
Rarely	90 (45)	52 (52)	38 (38)	
Often	40 (20)	8 (8)	32 (32)	
Yogurt Consumption				
None	46 (23)	28 (28)	18 (18)	0.005
Rarely	80 (40)	46 (46)	34 (34)	
Often	74 (37)	26 (26)	48 (48)	

The subjects showing NCCL had a predominant history of using medium to hard bristled toothbrush. Patients with variable movements through tooth brushing showed a statistically significant occurrence of NCCL. Fluoride toothpastes and xylitol gums contributed towards the protective factors against NCCLS, whereas, whitening or granular toothpastes did not associate with NCCL occurrence.

Bruxists were affected more by NCCL (<0.001) in comparison to the non buxists, however smoking, GERD, beetle nut chewing and use of removable partial dentures did not contribute to NCCL significantly (Table-III).

Table-III: Association of brushing technique and other habits in patients with NCCL.

Variables	Total n (%)	Non-NCCL (n=100)	NCCL (n=100)	*p*-value
Brushing Frequency n (%)				
Once	156 (78)	84 (84)	72 (72)	0.118
Twice	34 (17)	12 (12)	22 (22)	
Thrice	8 (4)	4 (4)	4 (4)	
Four times	2 (1)	-	2 (2)	
Bristles n (%)				
Soft	60 (30)	52 (52)	8 (8)	<0.001
Medium	108 (54)	38 (38)	70 (70)	
Hard	32 (16)	10 (10)	32 (32)	
Movements n (%)				
Vertical	34 (17)	12 (12)	22 (22)	<0.001
Horizontal	36 (18)	18 (18)	18 (18)	
Circular	46 (23)	40 (40)	6 (6)	
Variable	84 (42)	30 (30)	54 (54)	
Fluoride Toothpaste n (%)				
-No	76 (38)	26 (26)	50 (50)	<0.001
-Yes	124 (62)	74 (74)	50 (50)	
Granular Toothpaste n (%)				
No	168 (84)	84 (84)	84 (84)	1.00
Yes	32 (16)	16 (16)	16 (16)	
Whitening Toothpaste n (%)				
No	176 (88)	92 (92)	84 (84)	0.082
Yes	24 (12)	8 (8)	16 (16)	
Xylitol Gum n (%)				
None	156 (78)	70 (70)	86 (86)	0.02
Rarely	22 (11)	14 (14)	8 (8)	
Often	22 (11)	16 (16)	6 (6)	
Bruxism n (%)				
No	118 (59)	76 (76)	42 (42)	<0.001
Yes	82 (41)	24 (24)	58 (58)	
Smoking n (%)				
No	120 (60)	62 (62)	58 (58)	0.564
Yes	80 (40)	38 (38)	42 (42)	
GERD n(%)				
No	166 (83)	88 (88)	78 (78)	0.060
Yes	34 (17)	12 (12)	22 (22)	
Beetle Nut n (%)				
No	160 (80)	80 (80)	80 (80)	1.00
Yes	40 (20)	20 (20)	20 (20)	
RPD n (%)				
No	196 (98)	100 (100)	96 (96)	0.044
Yes	4 (2)	-	4 (4)	

DISCUSSION

Non carious cervical lesions, varying in appearance ranging from superficial crater to cuneiform defect, are not associated with carious lesions.[9,10] The progress of NCCL is a continuous process and a number of factors are involved in its development. These cases are commonly encountered in routine dental practice and are of a great challenge to restore for the dentist; hence prevention is the better option.[11-13]

occlusion and masticatory forces were initially proposed as the main causative factors of NCCL and these lesions were termed as abfraction lesions but in accordance with the numerous studies conducted to explain their etiology, it is generally wrong to identify only one mechanism to be the cause of any type of NCCLS as patient factors including mechanical (toothbrush/toothpaste), dietary (acidic food and beverages) as well as habitual factors are associated with the various degrees of tooth loss.[11,12]

Our study showed no statistically significant difference in both genders. On the other hand a study conducted on Indian population showed an majority of the lesion in female subjects.[13] Contrary to this other studies from china and Serbia demonstrated greater prevalence of NCCL in the male population.[9,14] Age is one of the factors associated with NCCL. Our study showed a significant prevalence of NCCL in indiviuals with mean age of 55.4 ± 0.8 years. Similar results were concluded in studies done on Serbian and Chinese populations.[15-17]

Our study showed a co-relation between vegetarian diet and NCCL similar to the study done in an indian orphanage. Similarly, consumption of citrus fruits, carbonated soft drinks and yogurt manifested high occurrence of NCCL in our study. A study done by Sandeep Kumar *et al*, in which he took a sample size of 395 and performed a descriptive cross sectional study. He proved the relation of citrus fruits with the frequency of NCCL but no significance of soft drinks and yogurt consumption with the condition.[13]

Habits related to dental hygiene, such as daily brushing frequency, pattern and bristles' stiffness are thought to be potential risk elements in the process of dental abrasion.[15] Our study demonstrated a significant association between the hardness of the bristles and variable movements of the tooth brush, followed by vertical and horizontal motions. However, no significance was found related to the frequency of brushing. Likewise, results from the Indian population showed higher incidence of NCCL with hard tooth-

brush and horizontal scrubbing ($p \leq 0.05$). Whereas, Chinese population showed no effect of hardness and tooth brushing force on the occurrence of abfractions.[13,18]

Fluoridated tooth pastes showed considerable protection against NCCL development whereas, whitening tooth pastes and those containing granules demonstrated no role in this regard. Patients chewing gums (mostly xylitol) showed lesser presentation of NCCL similar to the study conducted by Vejko Kolak where he examined 9499 teeth for NCCL presence and its demographics.[19] Smoking and beetle nut chewing revealed significance in this regard. Our study showed a relation between removable partial denture wearers and occurrence of NCCL on the clasped teeth.

According to Duangthip *et al*, heavy occlusal forces including bruxism played a significant role in the development and progression of NCCL, which was also evident in our study.[16] On contrary, there was no such findings in two of the Chinese studies.[16,20] Gastro esophageal reflux demonstrated no role in the occurrence of these lesions in our study as well as the study conducted by Que.[15]

CONCLUSION

Within limitations of this study, it is summarized that older age, acidic food consumption, use of hard bristles and vigorous motions during brushing and heavy occlusal loads play a significant role in the development of NCCL. Whereas gender, social habits like smoking and beetle nut chewing and gastric conditions like GERD had no significant role in the presence of NCCL in our study. Moreover, use of fluoridated tooth pastes and xylitol gums demonstrated prevention of the lesions.

Conflict of interest: None.

Author's Contributioin

MA: Data collection, analysis, execution, design, SMHS:, PJAS:, AB: Critical review, LA: Statistical analysis.

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