The Prevalence and Causes of Dental Non Carious Cervical Lesion in the Sulaimani population (Cross-sectional study)

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Abstract: *'Non-carious cervical lesion' (NCCL), is defined as any non-carious loss of hard tissue at the cervix of the tooth that have a wide variety of size, shape, symmetry, and location. They occur predominantly on the buccal surfaces of teeth, but may occur on the lingual or proximal surfaces or both. Clinically NCCLs have been classified according to the causes factors to Abression, erosion, and abfraction.*
Materials and methods: *This study was conducted in Sulaimani city, Shorish teaching center of dentistry, on 1006 randomly selected cases aged between 15-65 years old, 383 male and 623 females examined to evaluate the prevalence of NCCL among the known age group within the Sulaimani population.*
Results: *Among 1006 subjects, the prevalence of NCCL amounted to 29.1% among the studied population. The study results predict the highest pattern is abrasion 153 (15.2%) followed by erosion 149 (14.8%) and then Abfraction 54 (5.4%). Moreover, the results shown that the risk factors, like brush, acid, habit, hard food, GIT problem, malocclusion, were the commonest factors.*
Conclusion: *the prevalence of tooth NCCL it increased with advancing age, with the highest pattern is abrasion and the lowest pattern is abfraction.*
Keywards: *NCCL, Abression, Erosion, Abfraction.*

I. Introduction

'Non-carious cervical lesion' (NCCL) is defined as any non-carious loss of hard tissue at the cervix of the tooth [1]. NCCLs have a wide variety of size, shape, symmetry, and location. They occur predominantly on the buccal surfaces of teeth, but may occur on the lingual or proximal surfaces or both [2]. Where enamel is not present in the cervical part of the tooth, exposed dentin, a less densely mineralized tissue, is more susceptible to an increased rate of surface loss [3]. The initial stage of the lesion may be characterized by a wave-like or corrugated pattern in the disruption of the cervical surface enamel. Lesions may contain two separate individual wedge shape defects [4]. Histologically NCCLs have been classified according to the appearance: wedge-shaped, disc-shaped, flattened, irregular, and figured areas. , they vary from shallow grooves to broad dished-out lesions to large wedge-shaped defects with sharp internal and external line angles. 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, and more prevalent in the maxilla than in the mandible[5]. The NCCL classified according to their causes (Abrasion, Erosion and Abfraction [2, 6-9]. Abrasion is due to the mechanical process involving foreign objects or substances or due to mechanical interaction between food and teeth, whereas Abfraction is a mechanical process involving tooth flexLire by eccentric occlusal forces. While chemical etching and dissolution lead to the development of Erosion [10]. Although children may be present with dental erosion due to exessive acidic food consumption or due to gastroesophageal reflux [11]. Studies have concluded that the NCCLs have a direct correlation with age [12, 13]. Considering the influence of the brushing frequency on the development of the NCCL shown that people who brush twice daily have a statistically significant higher prevalence of NCCL [14]. Investigating the influence of bad habit such as Bruxism, found that 87% of bruxists have NCCL while only 20% of non-bruxists persons exhibit similar lesions[15]. Type of food texture and composition, particularly high acid content has a significant influence on the development of the NCCL. Whereas other studies predicted that the causes of NCCL are a multi-factorial lesion. This study is going to analysis the prevalence and causes of the dental noncarious cervical lesion in the Sulaimani city population.

II.   Materials And Methods

This study was conducted in Sulaimani city, Shorish teaching center of dentistry, on 1006 randomly selected cases aged between 15-65 years old, 383 male and 623 female examined to evaluate the prevalence of NCCL among the known age group within the Sulaimani population.

For the collection of data, a specially designed pre-tested form was used. The form consisted of demographic data (Name, age, sex, occupation and address), oral hygiene practices (Frequency and method of cleaning teeth, material used for cleaning and duration of cleaning teeth), dietary patterns like frequency of consumption of fruit drinks, lemon tea, colas, sports drinks and medical history including gastrointestinal disorders, frequent vomiting problem, type and duration of any medication and the history of adverse habits.

Clinical examination of the teeth for each person was done under the dental light, and by using a dental mirror and probe. All present permanent teeth were examined for, the evidence of a sign of tooth wear. The examination was performed in standardized method starting from the most posterior upper left side to the right side, then downward from the most posterior tooth on the right side to the left side and the teeth were examined for a cervical third of buccal and lingual surfaces.

Each returned questionnaire was given an identity number. Prior to data entry and analysis, the questions of the study were coded. The data were entered into a Microsoft Excel spreadsheet, then transported into SPSS (Statistical Package for the Social Sciences- version 21.0). Descriptive statistics (number and percentage) were calculated for all variables, as well as analytical statistics was done to find the relations between variables. Chi-square and Fisher exact test were used for calculation of P value. A P-value < 0.05 was considered as significant.

III.   Results

Among 1006 subjects, 383 (38.07%) male and 623 (61.93%) female. Prevalence of NCCL amounted to 29.1% among the studied population. The prevalence of the lesion increased with age and statistically shown highly significant between the age groups (P<0.001) as shown in the table (1) and figure (1). The reported data indicated that NCCL is slightly higher among male groups, (46.36%), while (38.13%) of the females. Although this is statistically not significant at P value=168 as shown in the table (2) and figure (2).

The study results predict the highest pattern is abrasion 153 (15.2%) followed by erosion 149 (14.8%) and then Abfraction 54 (5.4%). As demonstrated in (Table 3) the prevalence of abrasion was among age group 26-35, erosion among the age group 46-55, whereas abfraction are highest among the age groups 56-65, and this relation is highly significant at a P value<0.001.

The presence of different type of NCCL in the same case shown in (Table 4). The highest group is the combination of abrasion and erosion (14.3%); followed by abrasion and abfraction (6.5%); erosion and abfraction (4.1%); abrasion, erosion, and abfraction (2.7%) in sequence and it was highly significant.

Figure (3) Shows the association of each pattern and the risk factors, like brush, acid, habit, hard food, GIT problem, malocclusion, tea without sugar, and unknown, and this relation was highly significant at (P<0.001). The results predict that the brush risk factor is the commonest (29%) and malocclusion (19%. GIT problem is account only for (%). Figure (4) shown cases of erosion, abrasion, and abfraction in different teeth with varying ages and causes selected from study sample.

Table 1: The prevalence of NCCL in various age groups and both sexes at P value <0.001.

Age	Disease	
	No N (%)	Yes N (%)
15-25	201(87%)	30(13.1%)
26-35	278 (75.5%)	90(24.4%)
36-45	151(71.5%)	60(28.4%)
46-55	51(45.5%)	61(54.4%)
56-65	33(38.8%)	52(61.2%)
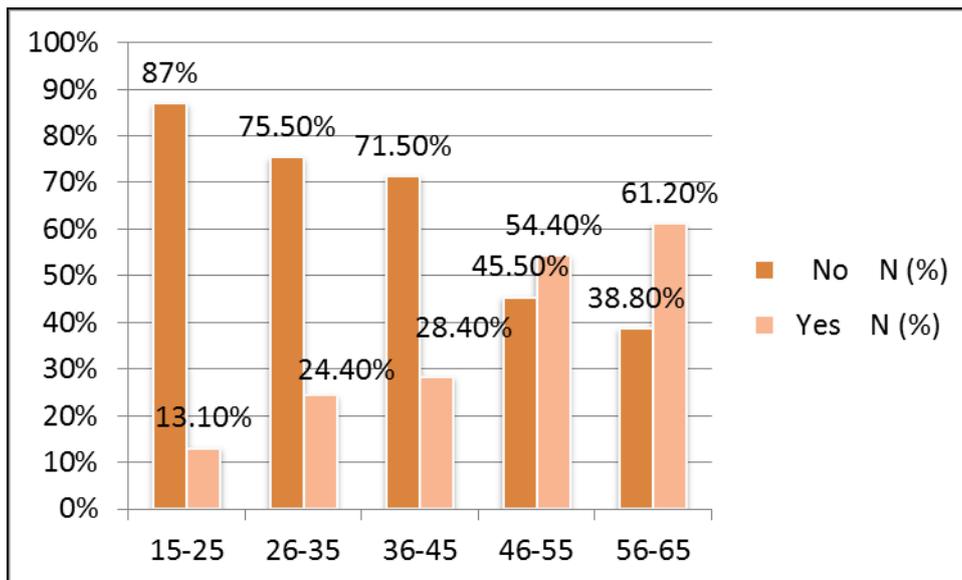
Figure 1: The prevalence of NCCL in five different age groups

Table 2: The prevalence of NCCL in five different sex groups a P value=168 t

Variables	Disease		P value
	No N (%)	Yes N (%)	
Male	261(36.7%)	121(41.3%)	0.168
Female	451(63.3%)	172(58.7%)	
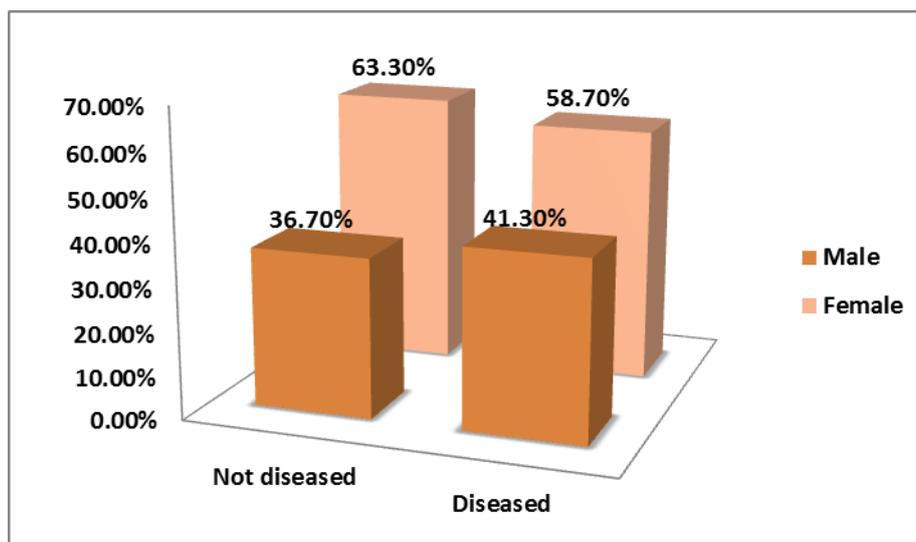
Figure 2: The prevalence of NCCL in different sexes

Table 3: The prevalence of each pattern according to the age

Variables	Age					Total	P value
	15-25 N (%)	26-35 N (%)	36-45 N (%)	46-55 N (%)	56-65 N (%)		
Abrasion							
Yes	6(3.9%)	60(39.2%)	35(22.9%)	30(19.6%)	22(14.4%)	153(15.2%)	<0.001
No	225(26.4%)	360(35.9%)	176(20.6%)	83(9.7%)	63(7.4%)	853(84.8%)	
Erosion							
Yes	16(10.7%)	32(21.5%)	26(17.4%)	42(28.2%)	33(22.1%)	149(14.8%)	<0.001
No	215(25.1%)	334(39.0%)	185(21.6%)	71(8.3%)	52(6.1%)	857(85.1%)	
Abfraction							
Yes	9(16.7%)	8(14.8%)	4(7.4%)	13(24.1%)	20(37.0%)	54(5.4%)	<0.001
No	222(23.3%)	358(37.6%)	207(21.7)	100(10.5%)	65(6.8%)	952(94.6%)	

Table 4: The presence of combined lesion among the positive cases

Combination of types	Erosion and Abrasion	Erosion & Abfraction	Abrasion and Abfraction	Erosion, Abrasion, and Abfraction	P value
No. & % of cases	42(14.3%)	12(4.1%)	19(6.5%)	8(2.7%)	<0.001
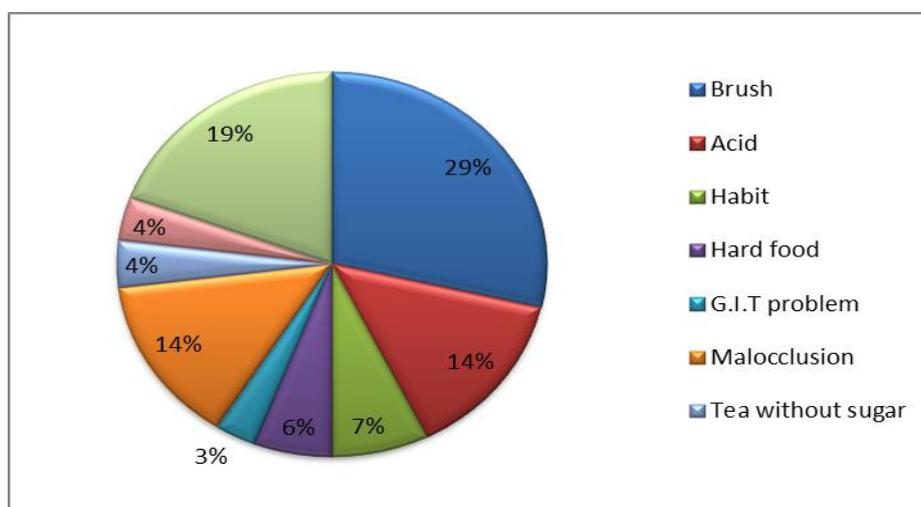
Figure 3: The common risk factors associated with the development of NCCL.

a: Erosion   b: Abrasion   c: Abfraction

Figure (4) shown some selected picture taken for examined patients involved in this study.
(a) Erosion, (b) Abrasion (c) Abfraction

IV.   Discussion

This study was applied to find out the prevalence of NCCL in the Sulaimani city population. Although the sample selected didn't represent all geographical city sectors, the sample was picked out from the patients visiting the main specialist dental health center in the city. The data were compiled by a questionnaire and clinical examination that include the relationship of NCCL with medical and dental histories, dietary habits, oral hygiene, brushing technique and occlusion. The cervical lesion were being classified as abrasion and erosion depending on patient history and clinical examination, whereas the abfraction cases were diagnosed depending on the patient bruxism and clenching habit with the signs of attrition on the incisal edge of anterior teeth and occlusal surface of posterior teeth. In this study, the researcher face problem to differentiate between abrasion and abfraction lesion. The formation of NCCLs has been influenced researchers and clinicians to look after the causes. Various hypotheses have been proposed for its aetiology, One of the theories is based on a biomechanical concept, in which the enamel breaks away at the cervical margin due to tooth bending under lateral occlusal forces and progressively exposes the dentin, where the process continues lead to the development of the lesion[16]. Whereas in vitro investigation for the development of NCCLS lesion, found that Significant noncarious cervical lesions were created via horizontal brushing with common commercial toothpaste, while brushing with water only did not create these cervical lesions [8]. The border lines between dental abfraction and dental abrasion were not quite obvious[8, 17]. Cervical wear was compared with the appearance of the occlusal surface of the same tooth, and within the same subject, the study showed increased frequency of attrition on the occlusal surfaces of those teeth with cervical wear[18]. Other studies also show the same result[15]. However, not all persons with cervical lesions demonstrate occlusal wear, which would indicate a bruxing habit and not all individuals with severe bruxing occlusal wear exhibit cervical noncarious lesions.[18]

The study results showed a direct link between aging and the amount of NCCL since tooth wear is accumulative process. In the younger age group, tooth wear was less prominent whereas, in older age group, it was more prominent [19-22]. It seemed that 45-years old age is the turning point for occurring NCCLs in this study, because of significant difference had been seen in age under or beyond 45-year-old age. The mechanism of this phenomenon is remained to discover[23]. Moreover, the abrasion shown high percent cases at age 26-35 year, this might ne due to wrong brushing techniques. Whereas the abfraction cases percente has direct relation with patient age. No sex relation to NCCL was found and statistically there was no significant relationship, other studies also show that there is no link exist between sex and NCCL[13, 19, 24].

In this study, the results predict that the combinations of different lesion patterns occur in the same patient. The highest prevalence is between abrasion and erosion, which is about (14.3%), and this in agreement with the with Hara et al, 2003, Attin et al., 2004 studies results. The combination of all three patterns of NCCL is about (2.7%).Both clinical and experimental observations show that individual wear mechanisms rarely act alone but interact with each other. The most important interaction is the potentiation of abrasion by erosive damage to the dental hard tissues. This interaction seems to be the major factor in occlusal and cervical wear. Several studies have shown that acid-softened dentine is also vulnerable to toothbrush abrasion, both in-vitro and in situ[25, 26].

It is accepted that NCCLs have a multifactorial etiology[16, 27]. The most frequent etiological factor reported in this study that cause NCCLs was the improper brushing (29%), and it is a commonest cause for abrasion (51.6%) among other etiological factors as shown in (Table 4). Sangnes 1976 found no link between the type of brushing teeth and NCCL, but Bergstrom 1988, stated a direct link between the brushing teeth horizontally and NCCL. This study results demonstrated that there is a relationship between the types of toothbrush and NCCL and this in agreement with Brandini 2011 study that stated that there is a direct link between using a hard toothbrush. The second major cause of NCCL in this study is dietary acid (14%), and it was a primary reason for erosion (30.2%). Although Bedar et al. 1996 found the same relation, another study by Pegoraro et al. 2005 on 70 surveyed participants who drink acidic beverages, did not support the conclusion.

Persons eating hard food experience NCCL in this study (6%), This result could be explained by the theory of increased occlusal force, because the abnormal occlusal loading forces are thought to cause tooth flexure, resulting in compressive and tensile forces in the cervical region of the tooth. Flexure may cause micro-fractures in the crystalline structure of the enamel and dentin, which may make the tooth susceptible to NCCLs as well as to caries.[16, 27]

Para –functional habit which include bruxism, nail biting, and clenching account as a fourth causative factor (7%) of NCCL prevalence and this is in line with the findings of other studies[21, 28] In bruxers, the magnitude of occlusal loading and cuspal deflection are greatest toward the end of a lateral excursion of the mandible. These horizontal forces induce both tensile and compressive stresses in the cervical area, which might explain the higher prevalence of NCCLs among bruxers[16]. Many studies showed a higher prevalence of NCCL was in subjects with bruxing habit than in subjects without a bruxing habit [29]. .Because some study subjects did not know that, the presence of symptoms of bruxism, even they didn't want to tell the truth, especially in young female, so the sleep bruxism tends to be underestimated[18] , resulted in the discrepancy of those studies. In this research, GIT problem like acid reflux, stomach fluids, account for (3%) as a causative factor for NCCL prevalence. Smith 2008 found a direct link between acid reflux, stomach fluids, and erosion prevalence.

V.   Conclusion

This cross-sectional study has shown the prevalence of tooth NCCL about 29.1%, and it increased with advancing age, with the highest pattern is abrasion 15.2%, and the lowest pattern is abfraction 5.4% among the studied population. In this study, other etiological factor has a significant relationship with NCCL, but variation between the gender was nonsignificant.

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VI. Conclusion

A conclusion section must be included and should indicate clearly the advantages, limitations, and possible applications of the paper. Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extentions.

Acknowledgements

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