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Non-carious cervical lesions of tooth with associated factors

Amit Kumar Singh1[1], Sagar Lama Tamang[1], Saurabh Kumar Roy[2]

[1]Department of Conservative Dentistry and Endodontics, Nobel Medical College and Teaching Hospital, Biratnagar, Nepal
[2]Department of Oral Pathology, Nobel Medical College and Teaching Hospital, Biratnagar, Nepal

Abstract

Background: The loss of tooth structures unrelated to caries in the cervical region is a characteristic of Non-Carious Cervical Lesions (NCCLs). This study looked into potential risk factors for NCCLs. The primary aim of this study was to assess the presence of NCCLs among the general population of the Residents of Biratnagar and the potential association with patient-related risk factors.

Method: A prevalence study of NCCLs included 96 respondents from residents of Biratnagar seeking Dental care. Using a Williams periodontal probe, the Smith and Knight tooth wear index was used to diagnose NCCLs. Information on factors associated with risk was gathered using a standardized questionnaire. Patient's demographic data were analyzed using descriptive statistics. Categorical variables were tested using the chi-square test.

Result: Out of 130 participants, non-carious cervical lesions (NCCLs) were diagnosed in 62(47.7%). There were statistically significant differences ($p<0.05$) in occurrence of NCCLs according to age, education, hardness of toothbrush, toothpaste use, tobacco chewing and long-term medication use. The NCCLs were most prevalent on mandibular first premolars (right: 21.5%, left: 23.1%). It was observed that maxillary incisors were more commonly affected than mandibular incisors.

Conclusion: The current study's findings imply that NCCLs have a complex etiology and occur often. The lowest prevalence was recorded among individuals younger than 35 years of age. Since most risk factors are modifiable, routine dental care may help identify NCCLs early on.

Keywords: Non-Carious Cervical Lesions, Patient-Related Risk Factors, Prevalence Study, Tooth

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Correspondence

Dr. Amit Kumar Singh, Department of Conservative Dentistry and Endodontics, Nobel Medical College and Teaching Hospital, Biratnagar, Nepal. Email: amitshare99@gmail.com, Telephone: 977- 9803340674

Introduction

Non-Carious Cervical Lesions (NCCLs) are a prevalent dental disorder marked by a loss of tooth structure that is not related to caries at the cervical portion of the tooth. Clinically represented by wedge-shaped lesions in the tooth's cervical area, they typically cause dentinal exposure, which results in dentinal sensitivity and discomfort.[1] These lesions are considered to be multifactorial, frequently the product of a combination of biological, chemical, and mechanical forces.[2] These lesions typically show up as erosion from the continuous presence of low-pH demineralizing agents, abrasion from mechanical wear from improper tooth brushing or abrasive dental products, or abfraction from a strong eccentric occlusal force that causes microfractures at the tooth's cervical area.[3]

The impact of NCCLs on the general quality of life and oral health of those affected has made the prevalence of these conditions become increasingly prevalent in recent years.[4] While research has been done all over the world, there aren't many that specifically address the prevalence and risk factors in Nepal. Global prevalence rates vary widely ranging from 9.1% to 91%.[5]

The primary aim of the study was to assess the prevalence of NCCLs among residents of Biratnagar along with their associated risk factors considering the unique demographic, dietary and lifestyle profile of Biratnagar to inform targeted preventive strategies, improve dental care and enhance overall well-being of the community.

Method

A descriptive cross-sectional study design was adopted to investigate the prevalence of NCCLs along with their associated risk factors. Participants for the study were selected from two primary sources: residents of Biratnagar visiting dental department of Nobel Medical College and residents seeking dental care who provide informed consent during routine community visits in the ratio of 1:1. The study was conducted from January 2024 to May 2024.

Sample size was calculated based on a confidence interval of 95% and an estimated prevalence rate of NCCLs of 50% as found in prior research and 10% margin of error. Using the formula $n=[Z^2 *p*(1-p)] /e^2$, calculated sample size was approximately 96. Sample size was increased from 96 to 130 to enhance the precision of prevalence estimates, improve the representativeness of the population and account for possible non-response or incomplete data. Convenience sampling method was used to achieve practicality and efficiency in reaching diverse group of participants.

Inclusion criteria for enrollment in the study included residents of Biratnagar 18yrs and above who provided informed consent for the study. Exclusion criteria included having extensive dental prosthesis, dental braces and previously undergoing tooth whitening procedure.

The study involved a combination of a questionnaire and clinical examination to gather comprehensive data about oral health in our community. The clinical assessment was done to determine tooth wear according to the Smith and Knight tooth wear index (TWI).

Clinical examination was done by a single investigator under adequate lighting focusing on the cervical portion of all tooth using sterile mouth mirror and periodontal probe with William's marking. The TWI scores were classified as 0 (no loss of contour), 1 (minimal loss of contour), 2 (defect <1mm in depth), 3 (defect 1-2 mm in depth) or 4 (defect >2 mm in depth/pulpal exposure/secondary dentin

exposure). R represents tooth surface could not be evaluated according to TWI (restored surface, fractured surface due to extensive caries or surface covered with plaque or dental calculus).

Participants were divided into two groups accordingly: a group with NCCLs and group without NCCLs.

A self-administered questionnaire; items of which were adapted from literature was employed to assess patient related risk factors.[6]

Sociodemographic data including age, gender, occupation, education was collected. possible risk factors related to dental care habits (frequency of toothbrushing, toothbrushing method, hardness of toothbrush, duration of toothbrush used, use of toothpaste, other oral hygiene aids), dietary factors (consumption of acidic foods, retaining drinks in mouth before swallowing), deleterious habits (smoking, alcohol, tobacco chewing), parafunctional habits and any medical conditions or medication use were included in the questionnaire.

The questionnaire was printed in both English and Nepali and were distributed to the respondents based on their preference. The investigator read and marked the items for the respondents who could not read and write.

Ethical approval was obtained from the Institutional Review Committee of Nobel Medical College (IRC-NMCTH 881/2023) prior to the start of the research.

Data collected were stored in Microsoft Excel Sheets and Statistical analysis was carried out using the Statistical Package for Social Science (SPSS) version 27(SPSS IBM, Inc., Chicago, IL, USA). Patient's demographic data were analyzed using descriptive statistics. Categorical variables were tested using the chi-square test. Values of $p<0.05$ were considered significant.

Result

The survey included 130 participants. Their age ranged from 16-75 years and average 33.54 years, females 77 (59.2%). Non-Carious Cervical Lesions (NCCLs) were diagnosed in 62 (47.7%) of participants.

Statistically significant differences in the prevalence of NCCLs were found according to age, education, hardness of toothbrush, toothpaste use, tobacco chewing and long-term medication use, p-values were <0.05.

There was no significant association identified according to duration of toothbrush used (p=0.647) and smoking (p=0.494). Lowest prevalence of NCCLs was identified among age groups 26-35 years (24.4%) and highest prevalence among 65yrs and above (100%), Table1.

Among respondents who used oral hygiene aids other than toothbrushing, those using powdered paste had the highest prevalence of NCCLs (86.7%) followed by those using mouth wash (66.66%), Table 2.

Distribution of NCCLs according to the tooth type and mouth quadrants were most prevalent on mandibular first premolars (right: 21.5%, left: 23.1%) followed by maxillary right first premolar (18.5%) and mandibular right second premolar (17.7%).

It was observed that maxillary incisors were more commonly affected than mandibular incisors with NCCLs. The distribution of TWI scores per teeth and mouth quadrant is displayed in Table 3.

In incisors, the majority of NCCLs showed a TWI score of 1. Maxillary incisors displayed higher

TWI scores than mandibular incisors. Higher frequency of scores 2, 3 and 4 were observed in mandibular and maxillary 1st premolars and 2nd premolars followed by first molar and canine.

Table 1. Clinicodemographic of respondents with non-carious cervical lesions NCCLs (n=130)

Variable	NCCLs 62 n(%)	Without NCCLs 68 n(%)	p-value
Gender			
Male	31(58.5)	22(41.5)	0.041
Female	31(40.3)	46(59.7)	
Age (years)			
16-25	17(36.2)	30(63.8)	<0.001
26-35	10(24.4)	31(75.6)	
36-45	12(75)	4(25)	
46-55	15(88.2)	2(11.8)	
56-65	3(75)	1(25)	
>65	5(100)	0	
Education			
Elementary or less	20(86.95)	3(13.05)	<0.001
Secondary	11(47.8)	12(52.2)	
Higher secondary	19(51.4)	18(48.6)	
University	12(25.5)	35(74.5)	
Hardness of toothbrush			
Soft	25(35.7)	45(64.3)	0.003
Medium	27(56.3)	21(43.8)	
Hard	10(83.3)	2(16.7)	
Duration of toothbrush used			
1-3 months	32(47.1)	36(52.9)	0.647
4-6 months	17(43.6)	22(56.4)	
7-12 months	10(52.6)	9(47.4)	
>12 months	3(75)	1(25)	
Toothpaste use			
Yes	47(41.6)	66(58.4)	<0.001
No	15(88.2)	2(11.8)	
Smoking			
Yes	7(56.3)	9(43.7)	0.494
No	53(46.5)	61(53.5)	
Tobacco chewing			
Yes	18(94.7)	1(5.3)	<0.001
No	44(39.6)	67(60.4)	
Consume alcohol			
Yes	22(50)	22(50)	0.706
No	40(53.5)	46(46.5)	
Medication use			
Yes	17(81)	4(19)	<0.001
No	45(41.3)	64(58.7)	

p<0.05 is considered significant, chi-square test, NCCLs (non-carious cervical lesions)

Table 2. Distribution of NCCLs based on use of oral hygiene aids other than toothbrushing (n=130)

	NCCL(62) n(%)	Without NCCL (68) n(%)
No other oral hygiene aids	36(43.4)	47(56.6)
Dental floss	7(41.17)	10(58.83)
Interdental brush	0	1(100)
Mouthwash	10(66.66)	5(33.33)
Powdered paste	13(86.7)	2(13.3)
Tongue scraper	2(100)	0

Table 3. Distribution on Tooth Wear Index (TWI) scores according to tooth type and mouth quadrants (n=130)

Teeth	TWI score	Maxillary				Mandibular			
		Right		Left		Right		Left	
		n	%	n	%	n	%	n	%
Central Incisor	0	115	88.5	112	86.2	121	93.1	118	90.8
	1	6	4.6	8	6.2	0	0	1	0.8
	2	2	1.5	2	1.5	1	0.8	2	1.5
	3	1	0.8	1	0.8	1	0.8	1	0.8
	4	0	0	1	0.8	0	0	0	0
	R	6	4.6	6	4.6	7	5.4	8	6.2
Lateral Incisor	0	119	91.5	116	89.2	121	93.1	119	91.5
	1	3	2.3	4	3.1	0	0	1	0.8
	2	2	1.5	3	2.3	1	0.8	2	1.5
	3	2	1.5	2	1.5	1	0.8	1	0.8
	4	1	0.8	1	0.8	0	0	0	0
	R	3	2.3	4	3.1	7	5.4	7	5.4
Canines	0	114	87.7	111	85.8	114	87.7	112	86.2
	1	6	4.6	10	7.7	9	6.9	7	5.4
	2	2	1.5	2	1.5	2	1.5	3	2.3
	3	4	3.1	2	1.5	0	0	4	3.1
	4	3	2.3	2	1.5	2	1.5	2	1.5
	R	1	0.8	3	2.3	3	2.3	2	1.5
1st Premolars	0	106	81.5	110	84.6	102	78.5	100	76.9
	1	3	2.3	3	2.3	10	7.7	7	5.4
	2	7	5.4	4	3.1	5	3.8	6	4.6
	3	6	4.6	6	4.6	7	5.4	9	6.9
	4	5	3.8	6	4.6	4	3.1	6	4.6
	R	3	2.3	1	0.8	2	1.5	2	1.5
2nd Premolars	0	109	83.8	110	84.6	107	82.3	109	83.8
	1	6	4.6	3	2.3	8	6.2	4	3.1
	2	3	2.3	3	2.3	2	1.5	4	3.1
	3	3	2.3	5	3.8	4	3.1	4	3.1
	4	3	2.3	3	2.3	6	4.6	4	3.1
	R	6	4.6	6	4.6	3	2.3	5	3.8
1st Molars	0	114	87.7	112	86.2	111	85.4	108	83.1
	1	1	0.8	2	1.5	3	2.3	5	3.8
	2	4	3.1	3	2.3	3	2.3	1	0.8
	3	3	2.3	3	2.3	1	0.8	6	4.6
	4	1	0.8	4	3.1	4	3.1	1	0.8
	R	7	5.4	6	4.6	8	6.2	9	6.9
2nd Molars	0	119	91.5	123	94.6	121	93.1	121	93.1
	1	2	1.5	1	0.8	2	1.5	0	0
	2	2	1.5	0	0	1	0.8	0	0
	3	1	0.8	1	0.8	0	0	0	0
	4	1	0.8	2	1.5	1	0.8	1	0.8
	R	5	3.8	3	2.3	5	3.8	8	6.2

Discussion

In present study the prevalence of non-carious cervical lesion was 47.7% while 68 (52.3%) patients were not found with non-carious cervical lesion. The worldwide prevalence of NCCLs among adults is 46.7 % and higher in older populations than younger ones. South America has the highest prevalence of NCCLs among different geographical regions, and general populations are more inclined to present these lesions than specific ones.[7]

Age and cervical lesions are highly correlated. Similar findings were discovered in this study, between age and cervical lesions, p<0.001. Prior research has demonstrated that the number of these lesions rose with increase in age that has split the population into six age groups.[8] These data support our findings. The frequency of all NCCL rose as people aged. When individuals under 65 and those over 65 were compared, it was discovered that the latter had a greater likelihood of developing lesions. In a study by Smith and colleagues, individuals under 65 and those over 65 were compared, and it was discovered that the latter group had a stronger relationship with lesions.[9]

A procedure wherein foreign items or substances are frequently put into the mouth and come into contact with the teeth is a typical cause of the formation of abrasive lesions.[10]

As was previously indicated, using a toothbrush with excessively stiff bristles, brushing with an abrasive dentifrice, or utilizing interdental brushes improperly can all contribute to this.[11] Gingiva recessions that reveal root cementum and the absence of enamel-root cementum contact in the tooth's neck region, which results in dentin exposure, both encourage the development of abrasive lesions.[12] Since these tissues have a critical pH of 6.2–6.7, which is higher than enamel, the acidic environment speeds up the deterioration.[13]

Non-carious erosive and abrasive lesions are frequently observed coexisting in clinical practice, particularly when mechanical and chemical forces are acting simultaneously.[14]

Hard tooth brushing and the rise in NCCL prevalence are directly related.[15] The majority of patients in the current study used medium-sized tooth brushes that are common in the studied society. Other important factors include the force applied to the toothbrush, its length, and the frequency of brushing. This study demonstrated a positive correlation between the number of NCCLs and toothbrushing pressure, as well as between the existence of relationship between NCCLs and toothbrush bristle stiffness.

The mandibular first premolars in the current study had the highest prevalence of NCCLs (right: 21.5%, left: 23.1%), which were followed by the maxillary right first premolar (18.5%) and the mandibular right second premolar (17.7%). Premolars and molars were similarly common, studies have reported noted more lesions were seen on the right side.[16] Premolars have the highest frequency of NCCLs due to their innately flawed shape, the increased occlusal stresses in the posterior area, and their early exposure to gingival recession.[17] The results of this study are consistent with previous research on the occurrence of NCCLs conducted by Kumar et al., showing that the teeth most commonly impacted by TWI levels (score) of 2 and 3 are the first mandibular premolars.[18]

Maxillary incisors were shown to be more frequently affected by NCCLs than mandibular incisors in our study. Conversely, the research has shown no significant difference between the upper and the lower arches or between the left and right side with regard to the prevalence of NCCLs.[19] Our findings are supported by another study in which the maxillary teeth were more affected, compared with those of the mandible.[20] Whereas contradictory findings in other studies have shown a higher degree of abrasion in mandibular incisors than maxillary incisors; however, the maxillary canines are more frequently affected by this type of lesion than the mandibular canines.[21]

There are some limitations in our study to consider. Presenting the NCCLs' percentage distribution according to etiology could have been helpful. However, because the primary etiological factor of NCCLs is not often evident, all forms of NCCLs were included in the current investigation, regardless of etiology. It is unclear whether the factors linked to the beginning of NCCLs differ from those linked to their advancement because distinct stages of the

condition were not examined. The current study did not assess other factors that might be more significant in the prevalence of NCCLs, such as socioeconomic characteristics. It will be helpful to conduct longer-term research investigating the relationship between exposure variables and lesions categorized based on size and form.

Conclusion

The results of the current study suggest that NCCLs occur frequently (47.7%) and have a multifactorial etiology. The lowest prevalence was recorded among individuals younger than 35 years of age. Aging, hardness of toothbrushes, toothpaste use, tobacco chewing and long- term medication use are the risk factors.

Author contribution

Concept and design- All; Literature review- AT; Data collection and analysis- All; Draft- All; Revision- AT; Accountability- All authors have read and agreed to the final version of the manuscript.

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Conflict of interest

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Supplementary material

The data and supplementary material that support the findings of this study are available from the corresponding author upon reasonable request.

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