

Etiological Factors Associated with Non-carious Cervical Lesions: A Study at the Municipal Center for Oral Health of Ouagadougou, Burkina Faso

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ABSTRACT

Introduction: This work sought to study the etiological factors of non-carious cervical lesions (NCCL) in a Burkinabe population consulting at the Municipal Center for Oral Health of Ouagadougou.

Materials and methods: This was a cross-sectional and descriptive study, carried out over the period from August 1 to October 31, 2020. The study population consisted of all adult patients diagnosed with NCCL (abrasion, erosion, or abfraction). The etiological variables assessed were the oral hygiene modalities, intrinsic acidity, extrinsic acidity, parafunctions, malocclusions, and stress.

Results: During the investigation period, 595 patients were examined and 82 of them had at least one NCCL, for an overall prevalence of 13.8%. Extrinsic factors (citrus and other fruits, sodas, fruit juices and energy drinks, wine and alcohol, and vinaigrette) constituted 50% of the erosion factors that were investigated. Horizontal brushing (traumatic brushing) performed by the majority of patients (82.9%) was the major etiology of abrasion. In terms of abfraction factors, stress and malocclusions were the most represented etiologies, at 42.7 and 29.3%, respectively.

Conclusion: NCCLs have multifactorial etiologies. Early diagnosis of signs of wear and tear would allow taking the necessary preventive and restorative measures aimed at tissue preservation.

Keywords: Burkina Faso, Etiological factors, Non-carious cervical lesions.

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INTRODUCTION

In recent decades, eating habits have changed profoundly, resulting in a marked increase in the frequency of non-carious lesions.¹ This type of dental wear primarily involves abrasive lesions and pathological erosive wears that are the consequence of intrinsic acidities (gastroesophageal reflux, vomiting, and heartburn) or the consumption of extrinsic acids (sodas, salad dressings, and lemon).^{1,2} Abfraction amounts to cervical wear of mechanical origin due to occlusal trauma.¹ These lesions have aesthetic and functional repercussions (hypersensitivity and pain) that are increasingly a reason for consultation. To remedy this, preventive measures, control of etiological factors, and follow-up should be implemented before possible restoration measures are considered.³

In Burkina Faso, very few studies to date have been in regard to these types of wear and tear injuries. It struck us as important, therefore, in light of this and in order to contribute to better management of non-carious cervical lesions (NCCL), to study their etiological aspects within a Burkinabe population attending the Municipal Center for Oral Health (MCOH) of Ouagadougou.

MATERIALS AND METHODS

Type, Setting, and Timing of the Study

This was a descriptive cross-sectional study with prospective collection carried out at the MCOH in Ouagadougou between August 1 and October 31, 2020.

Sampling

The study population consisted of all adult patients irrespective of their reason for consultation. Our sample was generated based

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on non-probabilistic sampling. Indeed, all patients in the study population who met the eligibility criteria were selected. Only patients with an NCCL were questioned and examined for possible etiological factors as well as to make a differential diagnosis regarding the clinical form.

Inclusion and Non-inclusion Criteria

All patients aged 18 years or older, who consulted during the survey period, who were diagnosed with NCCL, and who had provided informed consent to participate in the survey, were included in the study. All patients who could not directly answer the questionnaire for health reasons or due to a disability were excluded from the study.

Data Collection

The data collection technique was a combination of maintenance and clinical observation. The main data collection tool was a collection sheet. It was a questionnaire comprising two sections that collected sociodemographic information (age, gender, occupation, and place of residence), clinical data of the patients (reason for consultation, type of NCCL, and oral hygiene), and etiological variables. The etiologies investigated related to the following:

- Oral hygiene methods (type of toothbrush, hardness of the brush bristles, the brushing technique, the frequency of brushing, the hand used for brushing, the toothpaste used, and the use of bicarbonate);
- Extrinsic acidity (frequent consumption of acidic drinks, sodas, lemon juice, fruit juice, energy drinks, other fruits such as citrus and acidic foods, salad dressings, and taking medications);
- Intrinsic acidity (gastroesophageal reflux, belching, vomiting, heartburn, an acid taste in the mouth, and dry mouth);
- Parafunctions and bruxism (sleep bruxism and awake bruxism);
- Psychosocial stress [all psychosocial emotional phenomena that negatively impact the manducatory apparatus and that can be an indirect cause of occlusal stress (abfraction). Stress was recorded during the study, depending on whether the patient experienced it or had experienced it for a prolonged period over several weeks or permanently];
- Dental malocclusions and malpositions (overbite, occlusal trauma, rotation, transposition, extrusion, impacted tooth, Angle's classification, interference, etc.).

Frequent consumption was recorded when the food or drink item was taken daily or several times a week. Oral hygiene was determined using Greene and Vermillion's Simplified Oral Hygiene Index (SOHI).⁴ Other tools were also used for this collection, namely a dental examination tray (probes N°6, N°17, periodontal probe, mirrors, and tweezers), articulating paper, a refrigerant spray, a camera, and pens.

NCCL Diagnostic Criteria

The diagnosis of each of the lesions was based on the morphology of the clinical forms of NCCL already described in the literature.^{5,6} The first criterion was the geometric shape of the lesion; the second was the color of the tooth at the level of the lesion; the third criterion was the surface condition of the lesion when probed. The fourth criterion was the presence of lesions or associated manifestations such as wear of the occlusal surfaces, gum recession, dentin sensitivity, and the presence or absence of tartar in the worn cervical area.

Execution of the Investigation

The investigation took place in the consultation room, which was well lit and equipped with a dental chair with a scialytic lamp. The consultation team consisted of a dental surgeon and a nurse specialized in dentistry and two student trainees in the final year of dental surgery. These staff members participated in training on the use of the questionnaire and the diagnosis of NCCL. The clarification of the technical terms and their translation into the local Mooré and Dioula languages were carried out for this purpose. A pretest validated the tools before the official collection. The clinical examination was carefully conducted in order to accurately determine the causes of these NCCLs. The overall verification of the records was carried out before the data were entered.

Data Processing

In order to create a database, the information collected was entered into a form developed using EPI-info 7.1.3.3 software. A verification was undertaken immediately by the reporter for the day at the end of each session. The control of the input was initially performed physically. Checks were then carried out by a data manager. The data analysis was undertaken with the same EPI-info 7.1.3.3 software. The descriptive analysis of the sociodemographic and the clinical characteristics was detailed. Excel 2016 and Word 2016 were used to generate the tables and to compile the text items.

RESULTS

Characteristics of the Sample

Eighty-two patients had at least one NCCL out of the 595 patients who were examined during the study. The overall prevalence of NCCL, therefore, was 13.8%. The 40–60 years of age bracket was the most represented ($n = 42$; 51.2%), with extreme ages of 20 and 79 years. The average age for this series was 46.28 ± 12.92 (Table 1). There were 51 male patients, or 62.2%, and the sex ratio was 1.64. The majority of the patients (92.7%) resided in cities. There were 30 civil servants, amounting to the largest occupational category, at 36.6%, followed by workers in the informal sector, at 26.8%. The unemployed accounted for 14.6%, whereas pupils and students accounted for 6.1% of the patients.

Etiological Factors of NCCL

Erosion Factors

Extrinsic factors (citrus and other fruits, sodas, fruit juices and energy drinks, wine and alcohol, and vinaigrette) accounted for 50% of the factors investigated. Intrinsic factors were less represented and dominated by gastroesophageal reflux (14.6%). No cases of vomiting were reported (Table 2).

Table 1: Age distribution of the patients

Age bracket	Number (n)	Percentage (%)
[20–40]	25	30.5
[40–60]	42	51.2
[60–80]	15	18.3
TOTAL N (%)	82	100

Table 2: Distribution of the patients according to the conditions of erosion

Etiological factors	Frequency (n/N)	Percentage (%)
Extrinsic acidity		
Citrus and other fruits	74/82	90.2
Sodas	72/82	87.8
Fruit juices and energy drinks	71/82	86.6
Wines and other spirits	48/82	58.5
Vinaigrette	44/82	53.7
Medication intake	10/82	12.2
Intrinsic acidity		
Gastroesophageal reflux	12/82	14.6
Feeling of dry mouth	7/82	8.5
History of salivary gland pathology	1/82	1.2

Abrasion Factors

The common brushing technique was horizontal brushing (traumatic brushing), which was practiced by the majority of patients ($n = 45$; 82.9%) (Fig. 1). The most common daily brushing frequency was twice daily ($n = 45$; 54.9%) (Table 3). Nearly all of the patients ($n = 81$; 99%) used a manual toothbrush. One person used an electric toothbrush. In addition to a conventional manual toothbrush, one of the patients used a traditional miswak stick as a toothbrush. Patients who purchased toothbrush in retail pharmacies were 18.3%. A toothbrush with soft bristles was used by 18.3% of the patients (Table 3). Toothpastes purchased in counterfeit markets were the most used (Table 3). In terms of *abfraction* factors, stress and malocclusions were the most represented etiologies, at 42.7 and 29.3%, respectively. Bruxism was reported in six patients, or 7.3% (Table 4).

DISCUSSION

Restrictions, Limitations, and Strengths of the Study

The effects of coronavirus disease were the major problems in this study. Indeed, this pandemic has forced governments to enact restrictive measures in almost all areas of activity in order to limit the chain of transmission of the virus. The limitation of consultations to emergencies by the management of the MCOH led to a delay in the start of the data collection, which had been scheduled to take place during the period from March to May 2020. The limitations that the study may have are twofold:

- It was a single-site study;
- A significant element was the fact that at-risk patients, as well as the elderly, were strongly discouraged from oral consultations for the simple reason that they are particularly vulnerable to the coronavirus.

On the contrary, the target population (survey conducted directly among patients), as well as the prospective nature of the data collection, remains the first in Burkina Faso, thereby rendering this work particularly relevant. In light of these difficulties, the accessibility, availability, and experience of the staff of this health center made it possible to consistently carry out this work and to obtain these results.

Patients' Characteristics

Men were found to be affected the most. This situation has been found in several studies, although gender has generally not been

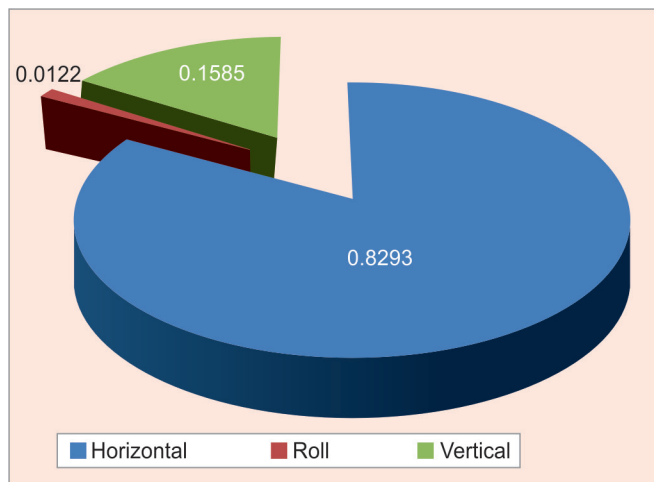


Fig. 1: Distribution of the patients according to the brushing technique

Table 3: Distribution of the patients according to brushing habits

Brushing habits of patients	Number (n)	Percentage (%)
Number of brushings per day		
One	28	34.1
Two	45	54.9
Three	6	7.3
More than three	3	3.7
Hardness of the bristle		
Hard	26	31.7
Medium	41	50
Soft	15	18.3
Type of toothpaste		
Toothpaste purchased in counterfeit market	74	90.2
Toothpaste purchased from retail pharmacies	8	9.8
TOTAL N (%)	82	100

Table 4: Distribution of the abfraction factors in the patients

Abfraction factors	Frequency (n/N)	Percentage (%)
Malocclusions	24/82	29.3
Bruxism	6/82	7.3
Stress	35/82	42.7

reported to be a risk factor for NCCL.⁷⁻⁹ By way of comparison, the results in Dakar of Kane et al.¹⁰ are of interest, as they found a male prevalence of 46.06%. A predominance of males with NCCLs may be related to the management of urban workloads and social workloads in the setting of a poor country, resulting in a source of anxiety and exposing them to the phenomenon of abfraction, which was high in this study.

This work revealed an increasing number of patients with NCCL as a function of age, although this growth was not linear. The average age was 46 years. With a series of 1,023 individuals aged between 20 and 69 and an average age of 46.1, Que et al.,¹¹ like other authors, have documented this increase in NCCL with age. Age has long been recognized as a risk factor for NCCL. Our study found that the 40–60 years of age bracket was the most affected, at 51.2%. Paradoxically, the 60–80 years of age bracket exhibited fewer cases of NCCL. This could be due to the non-representativeness of elderly people in the sample due to hesitation in consulting health services in general and certain specific services including dental surgery in particular, in these times of the coronavirus disease-2019 (COVID-19) pandemic.

Etiological Factors

NCCL cannot be dissociated from the etiological factors that generate them. The present study distinguished between recognized factors related to erosion, abrasion, and those related to abfraction.

Factors related to *abrasion* related to brushing, namely the technique, the frequency, and the quality of the toothpaste used. Brushing with toothpaste is the most commonly used and effective procedure in the practice of oral hygiene. However, in addition to the potential benefits of removing plaque and improving oral health, the misuse of toothpaste and a toothbrush can cause damage to hard and soft dental tissues.¹² Various factors such as the

brushing technique, the brush force, the duration and frequency of brushing, and the type of brush, especially the bristle stiffness, influence the phenomenon of abrasion.¹³ The present study found that the majority of patients brushed their teeth horizontally. This result could be explained by the unawareness of good brushing techniques but also by the lack of knowledge of the adverse effects of horizontal brushing. Traumatic brushing was mentioned at nearly equal proportions with our results in the publication by Ndiaye et al.,¹⁴ at a rate of 86%. In Switzerland, Haralur et al.,¹⁵ in a case-control study, found a 68% incidence of horizontal brushing in cases. The vestibular sides of the teeth are more prone to abrasion due to brushing too "energetically".¹⁶ Abrasion is most often associated with brushing teeth on their cervical edges.^{17,18} The majority of patients brushed their teeth twice a day. Brushing teeth twice a day with fluoridated toothpaste is the most effective preventive measure against tooth decay and especially early childhood caries.¹⁹ Manual toothbrushes were used the most. Electric toothbrushes, although better at preventing NCCL (better control of the force applied and of the brushing time), are used less often.²⁰ This could be explained by the fact that they have not been widely promoted in Burkina Faso. It has been shown that toothbrushes with soft bristles allow for more gentle brushing and hence have less of an adverse impact on dental and periodontal tissues. However, our study found a higher level of use of toothbrushes with medium or hard bristles. Haralur et al.¹⁵ reported that toothbrushes with hard bristles were used by 46% of patients with NCCL. In addition, the present study showed that "spearmint" toothpaste (toothpaste counterfeiting) was used the most (41.5%). This toothpaste is not available at retail pharmacies, and it can be abrasive. Patients appear to choose their toothpaste based on the cost and availability. This is evidenced by the many references to "toothpaste of 150 CFA francs" by some of the patients when referring to spearmint toothpaste during the collection.

Regarding the factors recognized in *abfractive* lesions, malocclusions, bruxism but above all psychosocial stress have been reported. This high prevalence of psychosocial stress could be explained by the high population density of cities, which imposes a high cost of living and especially by the cumulative management of activities for subsistence. In 20% of cases, stress was the cause of NCCL in the study published by Ndiaye et al.²¹ in 2021. Exorbitant proportions were found for parafunctions (70%) and malocclusions (50%) in the study by Al-Zarea⁸ in Saudi Arabia. The involvement of genetic and hereditary parameters of dental parafunctions or even malocclusions is becoming increasingly clear.

For *erosion factors*, extrinsic factors (acidic foods and beverages) dominated over intrinsic factors in terms of the frequency, with only gastroesophageal reflux disease (GERD) (12.4%) and dry mouth (8.5%) being reported for the latter. Medeiros et al.²² noted an 11.6% incidence of GERD and 30.2% for dry mouth. Citrus and other fruits (90.2%), sodas (87.8%), and energy drinks (86.6%) were the dominant trio of acidic foods and beverages. In keeping with this, the articles by Al-Zarea⁸ and Ndiaye et al.¹⁴ reported prevalences of 78 and 60%, respectively, for acidic-eating habits. The present study also found consumption of wine and other alcoholic beverages in 50% of cases. A recent study in Ouagadougou reported a prevalence of alcohol consumption of 65.14% among workers, and for 57.02%, the amount of alcohol consumed on a typical day of consumption was less than or equal to four drinks.²³ The high frequency of citrus and other fruits, as well as juices, could be related to the collection period of the study. Indeed, the period from August to October coincides with

the production season of citrus fruits (lemons, oranges, grapefruit, etc.) as well as certain acidic non-wood products including vines (*Saba senegalensis*).²⁴

CONCLUSION

NCCLs are becoming more common in dental consultations in Ouagadougou. Their etiologies are multifactorial, which can present a diagnostic problem for dentists. Early diagnosis of signs of wear and tear allows taking the necessary preventive and restorative measures aimed at long-term tissue preservation.

Ethical approval: This study protocol has been approved by the Research Ethics Committee of the Regional Health Directorate of the Centre (Deliberation N°2020-014/MS/RCEN/DRSC of February 26, 2020).

Informed consent: All the data were collected with written informed consent obtained from patients.

REFERENCES

1. Gunepin M, Derache F, Pêcheur M, et al. Erosion dentaire et consommation de boissons rafraîchissantes non alcoolisées. *AO News* 2016;2:7–10.
2. d'Incau E, Saulue P. Comprendre les usures dentaires. *Rev Orthop Dento-Faciale* 2011;45(4):405–422. DOI: 10.1051/odf/2011404.
3. Dietschi D. Traitement interceptif de l'usure dentaire par méthode directe. *Réal Clin* 2018;29(4):296–303. Available at: <http://archive-ouverte.unige.ch/unige:111699>.
4. Greene JG, Vermillion JR. The simplified oral hygiene index. *J Am Dent Assoc* 1964;68(1):7–13. DOI: 10.14219/jada.archive.1964.0034.
5. Imfeld T. Dental erosion. Definition, classification and links. *Eur J Oral Sci* 1996;104(2):151–155. DOI: 10.1111/j.1600-0722.1996.tb00063.x.
6. Walter C, Kress E, Götz H, et al. The anatomy of non-carious cervical lesions. *Clin oral investig* 2014;18(1):139–146. DOI: 10.1007/s00784-013-0960-0.
7. Gunepin M, Derache F, Blatteau JÉ, et al. Prévalence et facteurs de risque de survenue des érosions dentaires au sein de la population militaire. *Méd Armées* 2016;44(5):479–488. Available on: <https://fr.calameo.com/read/0003547858aefe49d071f>.
8. Al-Zarea BK. Tooth surface loss and associated risk factors in northern Saudi Arabia. *ISRN Dent* 2012;2012:161565. DOI: 10.5402/2012/161565.
9. Cunha-Cruz J, Pashova H, Packard JD, et al. Tooth wear: prevalence and associated factors in general practice patients: tooth wear in Northwest PRECEDENT. *Commun Dent Oral Epidemiol* 2010;38(3):228–234. DOI: 10.1111/j.1600-0528.2010.00537.x.
10. Kane AW, Faye B, Touré B, et al. Prevalence of non-carious dental lesions in the department of Dakar. *Odontostomatol Trop* 2004;108(27):15–18. PMID: 15853272.
11. Que K, Guo B, Jia Z, et al. A cross-sectional study: non-carious cervical lesions, cervical dentine hypersensitivity and related risk factors. *J Oral Rehabil* 2013;40(1):24–32. DOI: 10.1111/j.1365-2842.2012.02342.x.
12. Kumar S, Kumar S, Gupta A, et al. A profilometric study to assess the role of toothbrush and toothpaste in abrasion process. *J Dent Shiraz Univ Med Sci* 2015;16(suppl. 3):267–273. PMID: 26535407.
13. Sasan D, Thomas B, Mahalinga BK, et al. Toothbrush selection: a dilemma? *Indian J Dent Res* 2006;17(4):167–170. DOI: 10.4103/0970-9290.29869.
14. Ndiaye D, Bane K, Niand SO, et al. Fréquence et prise en charge des lésions cervicales non carieuses: enquête auprès des chirurgiens-dentistes Burkinabé. *Rev Col Odonto-Stomatol Afr Chir Maxillo-Fac* 2015;22(4):5–10. Available on: http://revues-ufhb-ci.org/fichiers/FICHIR_ARTICLE_525.pdf.
15. Haralur SB, Alqahtani AS, AlMazni MS, et al. Association of non-carious cervical lesions with oral hygiene habits and dynamic

- occlusal parameters. *Diagn Basel Switz* 2019;9(2):43–50. DOI: 10.3390/diagnostics9020043.
16. Grippo JO, Simring M, Schreiner S. Attrition, abrasion, corrosion and abfraction revisited: a new perspective on tooth surface lesions. *J Am Dent Assoc* 2004;135(8):1109–1118. DOI: 10.14219/jada.archive.2004.0369.
17. Wiegand A, Schlueter N. The role of oral hygiene: Does toothbrushing harm? *Monogr Oral Sci* 2014;25:215–219. DOI: 10.1159/000360379.
18. Johannsen G, Tellefsen G, Johannsen A, et al. The importance of measuring toothpaste abrasivity in both a quantitative and qualitative way. *Acta Odontol Scand* 2013;71(3–4):508–517. DOI: 10.3109/00016357.2012.696693.
19. Muller-Bolla M, Doméjean S. Dentifrices et vernis fluorés, intérêt dans la prévention des lésions carieuses. *Actual Pharm* 2019;58(587):49–53. <https://doi.org/10.1016/j.actpha.2019.04.009>.
20. Wiegand A, Burkhard JPM, Eggmann F, et al. Brushing force of manual and sonic toothbrushes affects dental hard tissue abrasion. *Clin Oral Investig* 2013;17(3):815–822. DOI: 10.1007/s00784-012-0788-z.
21. Ndiaye D, Niang SO, Seck A, et al. Fréquence et prise en charge des lésions cervicales non carieuses: enquête auprès des chirurgiens-dentistes dakarois. *Rev Col Odonto-Stomatol Afr Chir Maxillo-Fac* 2021;28(1):6–11. Available on: http://revues-ufhb-ci.org/fichiers/FICHIR_ARTICLE_3112.pdf.
22. Medeiros TLM, Mutran SCAN, Espinosa DG, et al. Prevalence and risk indicators of non-carious cervical lesions in male footballers. *BMC Oral Health* 2020;20(1):215–223. DOI: 10.1186/s12903-020-01200-9.
23. Ouedraogo AF, Lompo MSS, Sinka AK, et al. Consommation d'alcool chez les travailleurs à Ouagadougou (Burkina Faso). *Science et Technique, Sciences de la Santé* 2019;42(1):21–30.
24. Tiendrebéogo S, Ganou L, Compaoré CS, et al. Biochemical composition of *Saba senegalensis* fruits from Burkina Faso. *Afr J Food Sci* 2020;14(10):322–329. DOI: 10.5897/AJFS2020.1992.