


Dental Status of Dialysis Patients in Central Senegal: A Cross-Sectional Multicenter Study

Amadou Dieng^{1,2}, Serigne Ndam Dieng¹, Ndeye Yaram Diaw^{3*}, Seydina Ousmane Niang⁴, Meissa Diouf⁵, Mbathio Diop¹, Aida Kanoute¹, Massamba Diouf^{1,2}, Cheikh Mouhamadou Mbacke Lo¹, Daouda Faye¹

¹Department of Public Health, IOS, Faculty of Medicine, Pharmacy and Odonto-Stomatology, Cheikh Anta DIOP University, Dakar, Senegal

²IRL ESS 3189 CNRS/UCAD, Dakar, Senegal

³DDS, MSc, Clinical Practice, Military Hospital of Thiaroye, Dakar, Senegal

⁴Department of Conservative Dentistry and Endodontics, Institute of Odonto-Stomatology, Faculty of Medicine, Pharmacy, and Odonto-Stomatology, Cheikh Anta Diop University, Dakar, Senegal

⁵EDSEV, Cheikh Anta Diop University, Dakar, Senegal

Email: *adieng00@gmail.com

How to cite this paper: Dieng, A., Dieng, S.N., Diaw, N.Y., Niang, S.O., Diouf, M., Diop, M., Kanouté, A., Diouf, M., Lo, C.M.M. and Faye, D (2025) Dental Status of Dialysis Patients in Central Senegal: A Cross-Sectional Multicenter Study. *Health*, 17, 1288-1298.

<https://doi.org/10.4236/health.2025.1710085>

Received: July 29, 2025

Accepted: October 24, 2025

Published: October 27, 2025

Copyright © 2025 by author(s) and Scientific Research Publishing Inc. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

Background: Chronic kidney disease (CKD) patients on dialysis are at increased risk of oral health problems. Limited data exist on the dental status of dialysis patients in sub-Saharan Africa, particularly outside major urban centers. **Objective:** To investigate the dental status of dialysis patients in central Senegal and to identify associated factors. **Methods:** A cross-sectional multicenter study was conducted in three regions of central Senegal (Diourbel, Kaolack, and Louga) from February to May 2021. All dialysis patients meeting the inclusion criteria were examined. Dental status was assessed using the DMFT index (Decayed, Missing, Filled Teeth). Sociodemographic, clinical, and oral health access variables were collected. Statistical analysis included descriptive statistics, t-tests, ANOVA, and Pearson correlations. **Results:** Of 162 eligible patients, 147 participated (90.7% response rate). Mean age was 47.86 ± 14.98 years, with 52.4% females. Caries prevalence was 86.39% with a mean DMFT index of 7.91 ± 6.69 . Mean decayed teeth: 4.64 ± 3.85 , missing teeth: 3.30 ± 5.01 , filled teeth: 0.11 ± 0.89 . DMFT index varied significantly between centers ($p = 0.033$), with CHRL showing the highest (10.34 ± 8.03) and CHRK the lowest (4.94 ± 4.98). Only 19.7% had consulted a dentist since dialysis initiation, and 93.9% lacked health insurance. **Conclusion:** High caries prevalence and poor oral health status among dialysis patients in central Senegal highlight the urgent need for integrated oral health policies and improved access to dental care for this vulnerable population.

Keywords

Dialysis, Oral Health, Dental Caries, Chronic Kidney Disease, Senegal, Epidemiology

1. Introduction

The World Health Organization (WHO) defines oral health as the absence of oral or facial pain, oral or pharyngeal cancer, oral infection or injury, periodontal disease, tooth loosening, and loss [1]. According to a Global Burden of Diseases (GBD) study in 2015, nearly half the world's population suffered from disabilities due to oral disorders, including dental caries [2]. Being widespread, with 2.5 billion people affected worldwide, dental caries is indeed one of the most prevalent oral health pathologies. In Africa, the prevalence of tooth decay is rising steadily, affecting 60% - 90% of children and adults [3].

This situation is particularly concerning because oral health plays a key role in overall individual health. Poor oral health increases the risk of developing or maintaining chronic pathologies, including premature childbirth, acute endocarditis, and kidney diseases, notably chronic kidney disease (CKD) [4] [5].

Chronic kidney disease is the progressive, prolonged, and irreversible alteration of kidney exocrine and endocrine functions. It manifests as a progressive reduction in glomerular filtration rate, leading to elevated blood levels of toxic substances, of which creatinine and urea are the most important. This results in failure to maintain normal homeostasis and the association of other systemic pathologies, leading to a pathophysiological syndrome known as uremic syndrome, which is fatal without treatment [6].

In sub-Saharan Africa, CKD prevalence in the general population is 13.9%, with extreme values ranging from 2% in Côte d'Ivoire to 30.2% in Zimbabwe, and estimated at 20% in Ghana, Nigeria, and Rwanda [7]. In Senegal, hospital prevalence is 7%, and its complications have made it a public health problem [8].

Clinical manifestations of chronic kidney disease are highly variable and may involve all organs. Various oral cavity lesions have been described in uremic patients [9] [10]. In France, a study by Montagnac *et al.* conducted on 96 hemodialysis patients with a mean age of 64 years showed that 76% of patients each had an average of four carious teeth [11]. In Mali, Sy *et al.* reported a DMFT index of 6.37 with an overall caries prevalence of 59.7% [12].

In Senegal, epidemiological data reporting national indicators on population dental health status are rare; only piecemeal studies on circumscribed territories or particular groups exist. Moreover, the STEPS 2015 survey showed that 76.3% of Senegalese are affected by oral health problems [4].

Despite the scarcity of studies focusing on the oral health of CKD patients, there is a notable lack of data concerning the oral health status of dialysis patients, particularly those living outside Dakar. To broaden our knowledge of other localities, this study was conducted to investigate the dental status of kidney failure patients

on dialysis in central Senegal.

2. Materials and Methods

2.1. Study Design and Population

This was a cross-sectional multicenter study focusing on dialysis patients in central Senegal. It included all patients with CKD diagnosed by a nephrologist, followed in nephrology departments of selected hospitals, and treated with dialysis.

2.2. Study Setting

Central Senegal comprises 5 of the country's 14 regions. Of these, 3 have functional dialysis centers. The study took place in the Diourbel, Kaolack, and Louga regions. These sites were chosen for their central position in Senegal and because no previous study had been conducted in this area. Additionally, they constitute a medical crossroads and reference zone for a large part of the population and sub-region. Louga Region: Located 203 km from Dakar, the country's second-largest city by surface area. It comprises 3 departments (Louga, Kébémér, and Linguère) and houses 6.5% of Senegal's population. It has a regional hospital (CHRL) Ahmadou Sakhir Mbaye with a functional dialysis center. Diourbel Region: Divided into three departments (Bambey, Diourbel, and Mbacké). The region has three hospitals with functional dialysis centers: Matlaboul Fawzeyni National Hospital in Touba (CHMF), Diourbel Regional Hospital (CHRD), and Touba Ndamatou Level 1 Public Health Establishment (CHTN). Kaolack Region: The fourth most populous region. It has the El Hadji Ibrahima Niassé Regional Hospital (CHRK) with a dialysis center that serves as a focal point for outlying regions and certain sub-regional countries, including Gambia.

2.3. Selection Criteria

The patients selected had to be willing to take part in the study, have chronic renal failure and be on dialysis, be followed up in one of the nephrology departments of the selected hospitals, and be hemodynamically stable and cognitively capable of completing our questionnaires without significant distress.

2.4. Sampling and Sample Size

The survey was exhaustive, including all dialysis patients meeting the selection criteria in the study area during the collection period. Participants were recruited based on dialysis patient lists from each selected facility. These lists, obtained from service supervisors, showed 162 dialysis patients distributed as follows: Louga (CHRL): 42 patients, Diourbel (CHMF + CHRD + CHTN): 75 patients, and Kaolack (CHRK): 45 patients. However, 147 were present during the collection period, *i.e.*, 90.7% of the target population.

2.5. Data Collection and Variables

2.5.1. Data Collection Procedure

Prior to the survey, correspondence was sent to medical authorities requesting

authorization. For ethical reasons, before administering questionnaires, the survey objectives and importance were explained to patients to obtain signed informed consent.

Data collection was carried out by two final-year dental surgery students who were trained and calibrated for this survey. A pre-test was conducted on 10 dialysis patients at Aristide le Dantec University Hospital to assess interviewer understanding and correct the data collection form. Inter-examiner agreement was estimated using Cohen's Kappa coefficient ($\kappa = 0.81$).

2.5.2. Variables Studied

Sociodemographic Variables: care structure, age, sex, marital status, literacy level, professional activity and income level, health insurance

Clinical Variables: medical history (hypertension, diabetes, anemia) and duration on dialysis, biological parameters

Oral Health Access Variables: previous dental consultation, dental problems since dialysis admission, dental consultation since dialysis start, last dentist visit and dental care coverage, and barriers to dental care access

Clinical Dental Data: dental status assessed by the DMFT index, reflecting the number of permanent teeth that were Decayed (D), Missing (M), and Filled (F)

2.6. Collection Period

Collection took place every working day and involved all patients meeting the selection criteria. For Louga, it was held from February 15 to 17, 2021; for Diourbel, from February 02 to March 02; and for Kaolack, from May 03 to 07, 2021.

2.7. Statistical Analysis

Statistical analysis was performed using SPSS version 26.0. Descriptive statistics included means, standard deviations, frequencies, and percentages. Student's t-test was used for bivariate analysis between DMFT and dichotomous variables, with prior verification of Gaussian distribution and equality of variances. For variables with more than two categories, ANOVA was used when application conditions were met, followed by Tukey post-hoc tests when significant. Pearson correlation was tested between DMFT and biological constants. The significance level was set at 5%.

2.8. Ethical Considerations

The study was authorized by the university ethics committee after a protocol review. Administrative authorization was given by the directors of the concerned public health establishments and the heads of the nephrology departments where the study was conducted. All participants provided written informed consent.

3. Results

3.1. Sociodemographic Characteristics

With a participation rate of 90.7%, the Diourbel region was the most represented

in the sample, with 46.3% of dialysis patients. The mean age of dialysis patients was 47.86 years (± 14.98), ranging from 15 to 85 years. The 36 - 55 years age group was the most represented, with 49.7% of the sample. Nearly 53% of the study population was female, giving a male/female sex ratio of 0.91. Over 4/5 (83%) of patients in the sample were married. Nearly half (48.3%) of patients were literate in French and/or Arabic. More than 4/5 (80.3%) of dialysis patients were not engaged in paid work. However, of those who did work, 11 earned more than 150,000 CFA francs ($> \$265$) per month. Over 9/10 (93.9%) of the sample did not have health insurance (**Table 1**).

Table 1. Sociodemographic characteristics of dialysis patients (n = 147).

Variable	Category	Number (n)	Percentage (%)
Study Center	CHMF (Diourbel)	32	21.8
	CHRD (Diourbel)	25	17.0
	CHTN (Diourbel)	11	7.5
	CHRK (Kaolack)	38	25.9
	CHRL (Louga)	41	27.9
Age Group	15 - 35 years	30	20.4
	36 - 55 years	73	49.7
	56 - 75 years	39	26.5
	>75 years	5	3.4
Gender	Female	77	52.4
	Male	70	47.6
Marital Status	Single	12	8.2
	Divorced	4	2.7
	Married	122	83.0
	Widowed	9	6.1
Literacy	No	76	51.7
	Yes	71	48.3
Employment	Unemployed	118	80.3
	<50,000 CFA (<\$88)	8	5.4
	50,000 - 150,000 CFA (\$88 - \$265)	10	6.8
	>150,000 CFA (>\$265)	11	7.5
Health Insurance	No	138	93.9
	Yes	9	6.1

3.2. Oral Health Access and Behaviors

More than half the study sample (53.7%) claimed to have consulted a dentist at least once. More than two-thirds (69.4%) of the study population had no dental

complaints after admission to dialysis. Only 19.7% of dialysis patients had consulted a dentist since admission to dialysis. The study population's last dental visit was, on average, 2.5 years ago (± 4.8), with a median of 0.33 years and a range from 1 to 35 years. Regarding dental care coverage, 46.3% received no dental care, 40.1% paid themselves, 8.8% received free care, and 4.8% relied on family support (Table 2).

Table 2. Dental care access and oral health behaviors (n = 147).

Variable	Category	Number (n)	Percentage (%)
Ever consulted dentist	No	68	46.3
	Yes	79	53.7
Dental problems since dialysis	No	102	69.4
	Yes	45	30.6
Dental consultation since dialysis	No	118	80.3
	Yes	29	19.7
Dental care coverage	No dental care	68	46.3
	Self-paid	59	40.1
	Free of charge	13	8.8
	Family support	7	4.8
Barriers to dental care	Non-priority care	59	40.1
	Financial difficulties	29	19.7
	No barrier reported	43	29.3
	Don't know	14	9.5
	Lack of time	2	1.4

3.3. Dental Status

Caries prevalence among dialysis patients was 86.39%. The mean number of decayed teeth was 4.64 ± 3.85 , with a maximum of 21 caries; the mean number of missing teeth was 3.30 ± 5.01 , with a maximum of 27 missing teeth; the mean number of filled teeth was 0.11 ± 0.89 , with a maximum of 10 filled teeth; and the mean DMFT was 7.91 ± 6.69 (Table 3).

Table 3. Dental status and DMFT components (n = 147).

Component	Mean \pm SD	Range	Prevalence (%)
Decayed Teeth (D)	4.64 ± 3.85	0 - 21	86.39
Missing Teeth (M)	3.30 ± 5.01	0 - 27	68.03
Filled Teeth (F)	0.11 ± 0.89	0 - 10	7.48
DMFT Total	7.91 ± 6.69	0 - 32	86.39

3.4. Factors Associated with the DMFT Index

Significant variations were observed between healthcare structures ($p = 0.033$), with CHRL Louga demonstrating the highest mean DMFT (10.34 ± 8.03) and CHRK Kaolack recording the lowest values (4.94 ± 4.98). Age-related differences showed that adults presented higher mean DMFT values (8.42 ± 7.07) compared to younger patients (6.26 ± 4.53), though this difference was not statistically significant ($p = 0.11$). Gender analysis revealed that women exhibited higher mean DMFT scores (8.70 ± 6.80) than men (7.05 ± 6.51), but this difference did not reach statistical significance ($p = 0.13$). Marital status demonstrated significant associations with oral health, as widowed patients showed markedly elevated DMFT indices (13.22 ± 10.18) compared to all other marital categories ($p = 0.002$) (Table 4).

Table 4. Factors associated with the DMFT index.

Variable	Category	Number (n)	DMFT Mean \pm SD	Range	P-value
Study Center	CHMF	32	8.75 ± 5.36	1 - 24	0.033*
	CHRD	25	8.20 ± 6.75	1 - 31	
	CHRK	38	4.94 ± 4.98	0 - 23	
	CHRL	41	10.34 ± 8.03	2 - 32	
	CHTN	11	6.09 ± 6.47	1 - 25	
Age Group	Young (≤ 35 years)	30	6.26 ± 4.53	0 - 18	0.11
	Adult (> 35 years)	117	8.42 ± 7.07	0 - 32	
Gender	Female	77	8.70 ± 6.80	0 - 32	0.13
	Male	70	7.05 ± 6.51	0 - 31	
Marital Status	Single	12	5.75 ± 4.49	2 - 18	0.002*
	Divorced	4	3.75 ± 2.62	1 - 6	
	Married	122	7.95 ± 6.46	0 - 32	
	Widowed	9	13.22 ± 10.18	0 - 26	
Literacy	No	76	7.51 ± 5.41	1 - 26	0.37
	Yes	71	8.49 ± 7.81	0 - 32	
Employment	No	118	7.94 ± 6.39	1 - 26	0.37
	Yes	29	8.13 ± 7.85	0 - 32	

* $p < 0.05$: statistically significant difference.

3.5. Association between Medical Comorbidities and DMFT Index

Analysis of medical comorbidities showed that patients with diabetes had a higher mean DMFT (9.45 ± 7.23) compared to non-diabetic patients (7.65 ± 6.51), though this difference was not statistically significant ($p = 0.08$). Patients with hypertension had a mean DMFT of 8.12 ± 6.89 versus 7.43 ± 6.12 in normotensive

patients ($p = 0.52$). The presence of anemia was not significantly associated with DMFT values ($p = 0.73$) (**Table 5**).

Table 5. Association between medical comorbidities and DMFT index ($n = 147$).

Comorbidity	Status	Number (n)	DMFT Mean \pm SD	Range	P-value
Diabetes	No	119	7.65 \pm 6.51	0 - 31	0.08
	Yes	28	9.45 \pm 7.23	1 - 32	
Hypertension	No	52	7.43 \pm 6.12	0 - 25	0.52
	Yes	95	8.12 \pm 6.89	0 - 32	
Anemia	No	89	7.85 \pm 6.58	0 - 32	0.73
	Yes	58	8.03 \pm 6.89	0 - 31	

4. Discussion

Results showed a female predominance (52.4%) in the study population. This differs from Coulibaly J.'s findings in Mali, which reported a dialysis population of 60% men and 40% women [13]. This could be explained by the fact that in Senegalese society, women visit health facilities more than men.

The 36 - 55 years age range was most representative. This is a young adult population, contrary to data previously reported by SYLLA in the Nephrology Department of Aristide Le Dantec Hospital in 2011, who reported a population half of whom were under 40 years [14]. In Europe, particularly France, a study of 96 patients included a population with a mean age of 64 [11]. Numerous studies have shown that CKD is more frequent in the ≥ 65 years age group [15] [16]. The younger age of the African population compared to Europe could explain this difference.

In this study, the mean number of decayed teeth was 4.64 ± 3.85 with a maximum of 21. Mean DMFT was 7.91 ± 6.69 with a caries prevalence of 86.39%. These results are similar to those of Sy *et al.* in Mali, who reported a DMFT index of 6.37 in 2020 with a caries prevalence of 59.7% [12].

This situation could be explained by the deleterious state of oral health often found among Senegalese [4], combined with low socioeconomic level and unbalanced diet, which are the origins of pathologies often leading to CKD. These risk factors have a decisive influence on a person's caries status.

Regional Variations: Mean DMFT at CHRL (10.34 ± 8.03) was significantly higher ($p = 0.033$) than at CHRK (4.94 ± 4.98). This difference could be explained by fluoride presence in the Kaolack region. Indeed, DIALLO's study confirms excess fluoride in groundwater basin waters, with values varying between 2.35 and 7.20 mg/l [17]. These values exceed WHO recommendations of 0.5 to 1.5 mg/l. Modern dental research underlines the importance of fluoride in maintaining good oral hygiene and protecting against caries formation [18]. This finding has important public health implications, suggesting that targeted water fluoridation policies could be beneficial in regions with naturally low fluoride levels like Louga and Diourbel, while monitoring and potential defluoridation measures may be

needed in areas with excessive natural fluoride like Kaolack to optimize dental health outcomes.

Gender Differences: Although women showed higher mean DMFT scores (8.70 ± 6.80) compared to men (7.05 ± 6.51), this difference was not statistically significant ($p = 0.13$), indicating that gender was not a significant determinant of oral health status in this population.

Medical Comorbidities: The trend toward higher DMFT scores in diabetic patients, though not statistically significant, aligns with the known association between diabetes and poor oral health, particularly periodontal disease and increased caries risk. The lack of statistical significance may be due to sample size limitations or the complex interplay of multiple factors affecting oral health in this population.

This study has certain limitations that should be mentioned. Complementary examinations such as panoramic dental radiography and complete biological explorations could not be performed due to their cost, which was beyond reach for most patients, constituting a non-differential classification bias.

Regarding sample size, planned numbers for each center were ultimately revised downward due to problems related to patient absence, predefined collection duration at centers, and limited logistical resources. This situation is a source of selection bias, since absentees potentially carry relevant information on the study subject. However, this limitation is minimized by the high proportion (90.7%) of the target population surveyed.

5. Conclusions

This multicenter cross-sectional study, the first of its kind in central Senegal, reveals an alarming caries prevalence (86.39%) among dialysis patients, with a mean DMFT index of 7.91 ± 6.69 . Results highlight significant disparities between centers, particularly CHRL Louga with the highest DMFT (10.34 ± 8.03), and underscore the impact of socioeconomic factors on oral healthcare access, with 93.9% of patients lacking health insurance and 80.3% unemployed.

This situation necessitates an integrated public health approach, including systematic integration of oral healthcare in dialysis patient management, development of preventive strategies adapted to the Senegalese socioeconomic context, training of healthcare personnel on oral health-CKD links, and creation of financing mechanisms for dental care access.

Longitudinal studies and pilot interventions are necessary to evaluate the effectiveness of proposed strategies and their impact on the quality of life of dialysis patients in Senegal.

Acknowledgments

The authors thank all dialysis patients who participated in this study, the nephrology departments of the participating hospitals, and the dental surgery students who contributed to data collection.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

- [1] Oral Health (2025) <https://www.who.int/health-topics/oral-health>
- [2] Goudaert, M. and Danhiez, P. (2000) Dictionnaire pratique d'odontologie et de stomatologie. Masson.
- [3] Petersen, P.E., Bourgeois, D., Ogawa, H., Estupinan-Day, S. and Ndiaye, C. (2005) The Global Burden of Oral Diseases and Risks to Oral Health. *Bulletin of the World Health Organisation*, **83**, 665-669.
- [4] ANSD (2016) Enquête nationale sur les facteurs de risque des maladies non transmissibles Steps 2015. Rapport préliminaire: Les indicateurs clés. https://www.ansd.sn/ressources/publications/DV-STEPS-1-06-2016%20-%20MFin_ANSD%20vf.pdf
- [5] OMS (2022) Selon l'OMS, le défaut de soins bucco-dentaires touche près de la moitié de la population mondiale. <https://www.who.int/fr/news/item/18-11-2022-who-highlights-oral-health-neglect-affecting-nearly-half-of-the-world-s-population>
- [6] Azogui-Lévy, S. and Boy-Lefèvre, M.L. (2007) Synthèse du plan Buccodentaire. http://sante.gouv.fr/IMG/pdf/Synthese_du_plan_bucco-dentaire.pdf
- [7] Stanifer, J.W., Jing, B., Tolan, S., Helmke, N., Mukerjee, R., Naicker, S., *et al.* (2014) The Epidemiology of Chronic Kidney Disease in Sub-Saharan Africa: A Systematic Review and Meta-Analysis. *The Lancet Global Health*, **2**, e174-e181. [https://doi.org/10.1016/s2214-109x\(14\)70002-6](https://doi.org/10.1016/s2214-109x(14)70002-6)
- [8] Sumaili, E.K., Krzesinski, J., Cohen, E.P. and Nseka, N.M. (2010) Épidémiologie de la maladie rénale chronique en République démocratique du Congo: Une revue synthétique des études de Kinshasa, la capitale. *Néphrologie & Thérapeutique*, **6**, 232-239. <https://doi.org/10.1016/j.nephro.2010.03.008>
- [9] Union française pour la santé bucco-dentaire (2016) Fiche Conseil Maladie Cardiaque et Sante Bucco Dentaire. <https://share.google/zZWUX7feEwZZ0Jhci>
- [10] Cornebise, C. (1986) Pathologie médicale et odontologie. Ed Masson.
- [11] Montagnac, R., Delagne, J.M., Schillinger, D. and Schillinger, F. (2006) Pathologie buccodentaire et sa prise en charge chez les insuffisants rénaux chroniques. *Néphrologie & Thérapeutique*, **2**, 436-441. <https://doi.org/10.1016/j.nephro.2006.11.001>
- [12] Sy, S., Samake, M., Ba, B., Yattara, H., Coulibaly, S.B., Fofana, A.S., *et al.* (2020) Etat Bucco-dentaire des Insuffisants Rénaux Chroniques Non Dialysés Au Mali. *Health Sciences and Disease*, **21**, 114-117.
- [13] Jungers, P., Man, N.K., Joly, D. and Legendre, C. (2011) L'insuffisance rénale chronique: Prévention et traitement. 4th Édition, Lavoisier.
- [14] Naugle, K., Darby, M.L., Bauman, D.B., Lineberger, L.T. and Powers, R. (1998) The Oral Health Status of Individuals on Renal Dialysis. *Annals of Periodontology*, **3**, 197-205. <https://doi.org/10.1902/annals.1998.3.1.197>
- [15] Koko, J., Ategbro, S., Ateba Ngoa, U. and Moussavou, A. (2009) Etude épidémiologique de la carie dentaire en milieu scolaire à Libreville, Gabon. *Clinical Maternal and Child Health*, **6**, 1065-1073.
- [16] Catteau, C., Blaizot, A., Duhamel, A., Delzenne, A., Devillers, A. and Frimat, P. (2013)

Santé dentaire et facteurs associés dans un service de santé au travail du Nord (France). *Santé Publique*, **25**, 747-755. <https://doi.org/10.3917/spub.136.0747>

- [17] Rankin, S. and Lennon, M. (2014) Manuel de santé bucco-dentaire. Treethrelief 2014. <https://fr.scribd.com/document/601266048/FRENCH-Oral-Health-Manual-2017-ISBN-Sec>
- [18] Dieye, B. (2013) Évaluation de la carie dentaire au niveau des structures publiques selon la méthode ICDAS au Sénégal. Thèse, Université Cheikh Anta Diop de Dakar.