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High Prevalence and Risk Factors of Periodontitis among Blood Donors in a Sub-Saharan Population

Prévalence et facteurs de risque de parodontite chez les donneurs de sang en Afrique subsaharienne

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ABSTRACT

Introduction. Oral health is an important but ignored aspect of blood donors health in Africa. Periodontitis which can lead to infected blood has been associated to age, male gender and blood groups. Data from other countries existed but nothing is known about these associations in our context. This study aims to assess periodontal health and its associations to age, male gender and blood groups among a sub-Saharan population of blood donors. **Methods**. We performed a cross-sectional study in the 2 biggest blood banks Yaounde hospitals. Consenting healthy blood donors aged 18 to 50 years were recruited. They underwent oral examination. Common blood parameters (HIV, HBsAg, HCV Ab, TPHA serologies and blood groups ABO and Rhesus) and bucco-dental parameters including gingival index of Silness and Loe, clinical attachment loss, redness of gums and bleeding on probing were assessed. These variables were compared using Fisher's exact test, odds ratio calculated with 95% confidence intervals and statistical threshold was less or equal to 0.05. **Results**. A total of 207 participants, mean age 27.8 years ± 6.9 were included. Male was predominant (72.5%). Gingivitis occurred in 37.2%. The third of them was suffering of periodontitis (30.9%). Periodontitis was associated with age, male gender and blood group O (p<0.05). **Conclusion**. The prevalence of periodontitis in Cameroonian blood donors is high. Age, male gender and blood group O are risk factors identified. Blood banks in Yaounde, Cameroon should consider systematic screening of donors in search for periodontal diseases before blood donation to avoid possible bacterial bloodstream contamination.

RESUME

Introduction. La santé bucco-dentaire est un important mais ignoré aspect de la santé des donneurs de sang en Afrique Subsaharienne. La parodontite pouvant entrainer une infection du sang transfusé. Les facteurs de risque retrouvés ailleurs sont l'âge, le genre masculin et le groupe sanguin ABO. L'absence de données sur l'association entre ces 3 facteurs de risque et la parodontite chez les donneurs de sang à Yaoundé a motivé la réalisation de cette étude. **Patients et méthodes**. Nous avons réalisé une étude transversale dans les deux plus grandes banques de sang de la ville de Yaoundé. Tous les donneurs de sang âgés de 18 à 50 ans, en bonne santé et consentant ont été recrutés. Ils ont subi un examen oral. Les paramètres hématologiques (sérologies VIH, hépatite virale B, hépatite virale C, syphilis, groupages sanguins ABO et Rhésus) et les paramètres bucco-dentaires (index gingival de Silness et Loe, perte d'attachement, rougeur des gencives et saignement au passage de la sonde) ont été évalués. Les variables ont été comparées à l'aide du test exact de Fischer. L'intervalle de confiance était à 95% et le seuil de significativité statistique p <ou =0,05. **Résultats**. Au total 207 donneurs de sang, d'âge moyen 27.8 ans ± 6.9 ont été inclus. Les hommes étaient prédominants (72,5%). La gingivite touchait 37.2% des participants. Le tiers des donneurs souffraient de parodontite (30.9%). La parodontite était statistiquement associée à l'âge, au genre masculin et au groupe sanguin O (p<0.05). **Conclusion**. Les prévalences de la gingivite et de la parodontite chez les donneurs de sang au Cameroun sont élevées. Les facteurs de risque identifiés de la parodontite sont l'âge, le genre masculin et le groupe sanguine O. Le dépistage de la maladie parodontale pourrait être introduit dans la sélection des donneurs de sang au Cameroun.

CAPSULE SUMMARY

What is known about the subject
Periodontitis in blood donors can lead to bacterial contamination of blood transfused.
The question addressed in this study
What are the risk factors of periodontitis in a Subsaharan population of blood donors?
What this study brings new
1. The high prevalence of periodontitis in blood donors
2. The correlation of male gender, age, blood group O and periodontitis among blood donors.

Implications for practice, policy or future research.
Enhancing sensitization of good oral health in men, adults and blood group O donors should be done. Another study lead to compare prevalence of bacterial infected bloods bags in blood donors suffering from periodontitis and the one in good health donors is needed

INTRODUCTION

Periodontal disease is the most common oral condition of human population. It is prevalent both in developed and developing countries and affect about 20-50% of global population [1]. In Germany, 74% of blood donors are affected [2]. Studies done in Cameroon reported 77.2% [3] and 43.4% [4]. In various groups excepted blood donors. Periodontitis which involves the loss of periodontal attachment and supporting bone [5] resulted in the progress of gingivitis, both components of periodontal disease [6]. Presentations of periodontitis span a spectrum including asymptomatic, minor bleeding gums with toothbrushing, dental pain, tooth loss and deterioration in masticatory function resulting in poor nutrition [1]. Periodontitis causes inflammatory breakdown of tooth supporting tissues, as well as deepening and ulceration of periodontal pockets through which bacteria may gain access to the blood stream [7,8]. It increases the risk of bacterial contamination of blood products [2]. Patients with periodontitis have a relative risk of 6.4 for donating bacterium-contaminated blood compared to periodontally healthy donors [9].

Many risk factors for the development of periodontitis have been reported worldwide. They include age, smoking, poor oral hygiene, obesity, diabetes, lower socioeconomic status [1,10], male gender [11].Studies have shown that ABO blood groups are linked to various diseases, such as cancer, cardiovascular diseases, infections and hematologic disorders, cognitive disorders, circulatory diseases, metabolic diseases, and malaria [12]. Moreover, it is known that ABO groups may constitute a risk factor for developing periodontal disease. The colonization number of bacteria, which is a primary responsible factor of periodontal diseases, varied with ABO blood groups [13].Al-Askar [14] in a systemic review found that blood group O had the most frequent event rate among blood group phenotype in periodontitis. It was also found that blood group AB was protective in periodontitis.

Blood donors with periodontitis have a relative risk of 6.4 for donating bacterium-contaminated blood compared to periodontally healthy blood donors [9]. Periodontitis is not an exception criteria for blood donation in Sub-saharan Africa were blood donors are young adults, more often men than women [15]. There is paucity of data on the association between age, gender, ABO groups and periodontitis among blood donors in Cameroon. Furthermore, there is an increase surge in blood donations and no routine buccodental examination is performed investigating the presence of periodontitis. Thus, reporting on risk factors of periodontitis on blood donors could help to enhance sensitization in order to obtain safety blood in Yaounde, Cameroon.

MATERIALS AND METHODS

Study design and location
A descriptive bicentric cross-sectional study was carried out from December 2022 to May 2023 at the two major blood banks of the Yaounde: University Teaching Hospital (YUTH) and Yaounde Central Hospital (YCH).

Study population
Volunteers blood donors aged 18 to 50 years, having 20 teeth excluding the third molar and brushing once daily were informed about the study during routine blood donation and campaigns.

Study procedure and data collection
When coming back for collecting their results, volunteers blood donors confirmed negative for HIV, hepatitis B, hepatitis C by Rapid Diagnosis Tests (RDT) and ELISA and syphilis by TPHA were approached. Those who consented were enrolled in the study. Sociodemographic characteristics and clinical variables were collected. Sociodemographic characteristics consisted on age and gender. Clinical variables were buccodental examination in search of signs of periodontitis and blood groups. Buccodental Periodontal pockets examination included: gingival bleeding if the gums bleed immediately; periodontal pocket, as evaluated upon placing a graduated probe in the gingival sulcus and determining the length of the probe that enters (<3, 4-6, ≥6 mm); Clinical attachment loss determined by adding the probing depth to the gingival margin level; redness of gums determined by visual evaluation of the gingiva of patients; gingival index was obtained by inspection (score 0 = Normal gingiva, score 1 = Mild inflammation - slight change in colour, slight oedema. No bleeding on probing, score 2 = moderate inflammation - redness, oedema, glazing. Bleeding on probing, score 3 = Severe inflammation - marked redness and oedema, ulceration. Tendency toward spontaneous bleeding); bleeding on probing [16].These data were registered in six locations per tooth (mesiobuccal, mid-buccal, distobuccal, mesiolingual, mid-lingual, and distolingual) using the William Probe. Bleeding on probing and positive or negative suppuration were recorded for each site.

We defined gingivitis subjects as displaying less than 3 mm of attachment loss, periodontal pockets depth less than 3 mm and bleeding on probing; periodontitis subjects as exhibited attachment loss at least 3 mm and periodontal pockets depth more than 4 mm. Healthy subjects where those having less than 3 mm of attachment loss, periodontal pockets depth less or equal to than 3 mm with no bleeding on probing [17].

Blood grouping ABO and Rhesus were determined from the Beth-Vincent and Simonin tests.

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Sample size was calculated using Cochran's formula, as follows: $N = p(1-p)z^2/d^2$ where N is the sample size, p is the prevalence of periodontal diseases among adult Cameroonians from a previous study; 77.2% in 3 hospitals in Cameroon [3], z is the decision variable at confidence of 95% (z = 1.96), and d is the sampling-related error risk (d = 6% or 0.06). The minimum sample size for the study was thus estimated at 188 participants. Assuming the possibility of incomplete data from about 5% of participants, we aimed at recruiting at least 198 participants.

Statistical analysis

Data was transferred from paper forms to Microsoft Excel spreadsheets and cleaned prior to analysis in the software R version 4.2.2. Continuous variables were summarized as means with standard deviation. Categorical variables were expressed as percentages and compared using Chi-square or Fisher tests as appropriate. We investigated risk factors for selected gingivitis and periodontitis among different blood groups using multiple logistic regression models adjusted for socio-demographic variables. All p-values < 0.05 were considered to be statistically significant.

Ethical considerations

Ethical approval was obtained from the Institutional Review Board of the Faculty of Medicine and Biomedical Sciences of the University of Yaounde 1. We also obtained administrative approval from the general managers of the YCH and CHUY. Verbal informed consent was obtained from the eligible individuals who were 18 years of age and older.

RESULTS

A total of 207 blood donors, mean age 27.8 years ± 6.9, were enrolled. The sex ratio was 2.63 (Table I).

Table I : Sociodemographic characteristics of two hundred and seven blood donors in Yaounde, Cameroon

Characteristics	N = 207[1](%)
Age	
Mean± SD	27.8 ± 6.9
Median[IQR]	26.0 [22.0 - 32.0]
Range	18.0 - 49.0
Age group	
[15,25]	82 (39.6)
[25,35]	92 (44.4)
[35,50]	33 (15.9)
Gender	
Male	150 (72.5)
Female	57 (27.5)

Clinical attachment loss less than 3mm (60.9%), abnormal redness of gums (74.9%), gingival index at 2 (39.6%), bleeding on probing (77.8%), dental plaques (71.5%) and periodontal pockets less than 6 mm (90.3%) were predominant clinical characteristics. Blood group O and Rhesus positive were most found (53.6% and 99% respectively). The overall prevalence of periodontitis was 64/207 (30.9%), gingivitis occurred in 77/207 (37.2%) participants (Table II).

Table II: Clinical and hematological characteristics of two hundred and seven blood donors in Yaounde, Cameroon

Characteristic	N	%
Clinical attachment loss<3mm		
present	126	60.9
absent	81	39.1
Abnormal redness of gums		
present	155	74.9
absent	52	25.1
Gingival index (Silness and Loe)		
2	82	39.6
3	43	20.8
0	42	20.3
1	40	19.3
Bleeding on probing		
Yes	161	77.8
No	46	22.2
Dental plaques		
Yes	174	84.1
No	33	15.9
Periodontal pockets > 6mm		
No	187	90.3
Yes	20	9.7
Periodontal pockets 4-5mm		
No	148	71.5
Yes	59	28.5
Normal		
No	174	84.1
Yes	33	15.9

Table II: Clinical and hematological characteristics of two hundred and seven blood donors in Yaounde, Cameroon

Characteristic	N	%
Gingivitis		
No	130	62.8
Yes	77	37.2
Periodontitis		
No	143	69.1
Yes	64	30.9
ABO grouping		
O	111	53.6
A	51	24.6
B	35	16.9
AB	10	4.8
Rhesus		
Positive	205	99
Negative	2	1

Abnormal redness of gums 57/207(36.8%), gingival index of 2 and 3; 30/207 (14.5%) of each were explicating periodontitis (Table III). Periodontitis was significantly associated with Age (p=0.007), male gender (p=0.004) and blood group O (p=0.001) were statistically associated with periodontitis (Table IV).

Table III: Factors explicating peridontitis in two hundred and seven blood donors in Yaounde, Cameroon

Characteristic	Yes, N = 64[1]	No, N = 143[1]	OR[2]	95% CI[2]	p-value
Age					**0.004[3]**
Mean ± SD	29.8 ± 7.3	26.9 ± 6.5			
Median [IQR]	30.0 [24.0 - 33.0]	25.0 [22.0 - 31.0]			
Range	18.0 - 49.0	18.0 - 48.0			
Age group					
[15,25]	18 (22.0)	64 (78.0)	Ref	Ref	
[25,35]	32 (34.8)	60 (65.2)	1.90	0.97, 3.78	0.064
[35,50]	14 (42.4)	19 (57.6)	2.62	1.10, 6.27	**0.029**
Gender					
Female	7 (12.3)	50 (87.7)	Ref	Ref	
Male	57 (38.0)	93 (62.0)	4.38	1.97, 11.2	**<0.001**
abnormal redness of gums					
absent	7 (13.5)	45 (86.5)	Ref	Ref	
present	57 (36.8)	98 (63.2)	3.74	1.67, 9.57	**0.003**
gingival index (silness et loe) group					
<=1	4 (4.9)	78 (95.1)	Ref	Ref	
2	30 (36.6)	52 (63.4)	11.2	4.14, 39.6	**<0.001**
3	30 (69.8)	13 (30.2)	45.0	15.0, 172	**<0.001**
ABO grouping					
A	7 (13.7)	44 (86.3)	Ref	Ref	
AB	1 (10.0)	9 (90.0)	0.70	0.04, 4.67	0.751
B	9 (25.7)	26 (74.3)	2.18	0.73, 6.76	0.166
O	47 (42.3)	64 (57.7)	4.62	2.01, 12.0	**<0.001**

OR : Odd Ratio   CI : Confidence Interval

Table IV: Multiple logistic regression investigating peridontitis risk factors in two hundred and seven blood donors in Yaounde, Cameroon

Characteristic	OR[1]	95% CI[1]	p-value
Age (in years)	1.067	1.018-1.119	**0.007**
Age group			
[15,25]	Ref	Ref	
[25,35]	2.20	0.93, 5.36	0.076
[35,50]	1.71	0.53, 5.55	0.368
Gender			
Female	Ref	Ref	
Male	4.65	1.74, 14.2	**0.004**
Abnormal redness of gums			
absent	Ref	Ref	
present	0.21	0.03, 0.98	0.067
Gingival index (Silness and Loe) group			
<=1	Ref	Ref	
2	20.3	4.98, 146	**<0.001**
3	101	21.5, 787	**<0.001**
ABO grouping			
A	Ref	Ref	
AB	0.77	0.03, 7.60	0.838
B	2.45	0.65, 9.76	0.190
O	5.57	2.04, 17.1	**0.001**

DISCUSSION

The study revealed that prevalence of periodontitis among blood donors is high. Age, male gender and blood group O are risk factors of periodontitis in blood donors.

The third of blood donors had periodontitis. Others authors; Fokam et al. and Ngoude et al. found higher prevalences; 53.2% [11] and 43.4% [4] of periodontitis respectively in different groups. The difference between our result and those of these authors could be explained

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by the fact that we worked on an healthy population. In South Africa, Chikte et al. found a prevalence of 60%[18]. This highest prevalence could be attributable to the fact that their population came from a geographical area characterized by low socio-economic status. Low socio-economic status including low educational levels and social class has been implicated in imputing increased risk for periodontitis.

Age significantly associated with periodontitis was also found by many authors [4, 19-20]. For Franceschi et al. [21], there was a possible occurrence of periodontitis on the increasing age. Older individuals tend to have colonization of oral mucosa by the higher levels of gram-negative germs they have. These lead to periodontitis [22]. Our study found that men had a significantly higher risk of having periodontitis than women. Previous findings reported similar results in sick patients on different countries [20,23]. This could be due to the fact that men attend clinics late comparatively to women. Then, disease can easily progress leading to periodontitis. Blood group O significantly associated with periodontitis was also reported by many authors [24,25] . In opposite, Francis et al. [26] concluded that there was no significant difference in distribution of ABO blood group with the presence of periodontal disease. It could be due to the fact that we had a larger sample size and subjects in that study were divided into two groups, with no periodontitis and with periodontitis.

Limitations

Our study had some limitations. Some cases of periodontitis may have been missed since we did not perform intraoral Xray to determine bone loss which is a sign of periodontitis. Moreover, we did not also evaluate dental mobility on buccodental examination which is a parameter on evaluation of periodontitis. But this could not void the validity of our results.

CONCLUSION

Periodontitis has a high prevalence in blood donors. There is a correlation between male gender, blood group O and periodontitis in Yaounde. Efforts to provide periodontal health to blood donors in Yaounde, Cameroon are needed.

REFERENCES

1. Nazir MA. Prevalence of periodontal disease, its association with systemic diseases and prevention. Int J Health Sci. 2017; 11:72–80.

2. Schmalz G, Hubscher AE, Angermann H, et al. High prevalence of periodontitis in blood donors and the possibility of questionnaire-based screening- results of a cross-sectional study. Transfus Med.2019;29:394-400 [PubMed] [Google Scholar].

3. Belinga LEE, Ngan WB, Lemougoum D, Nlo'o ASPE, Bongue B, Ngono A, et al. Association between periodontal diseases and cardiovascular diseases in Cameroon. J Public Health Afr 2018; 9:761.

4. Jean Xavier Ekouelkoum Ngoude, Vicky Jocelyne Ama Moor, Tsobgny Tsague Nadia-Flore, Batakeh B. Agoons, Gamgne Guiadem Catherine Marcelle, Elage Epie MacBrain, Daryl Nzokou Tcheutchoua and Jan René Nkeck. Relationship between periodontal diseases and nexly-diagnosed metabolic syndrome components in a sub-Saharan population: a cross sectional study. BMC Oral Health.2021; 21:326. Doi: 10.1186/s12903-021-01661-6.

5. Jin LJ, Lamster IB, Greenspan JS, Pitts NB, Scully C, Warnakulasuriya S. Global burden of oral diseases: Emerging concepts, management and interplay with systemic health. Oral Dis 2016;22:609-19

6. AL-Bahadli, Muhamad A.H., Hayder S.B, Hamsa J.M., H. and Zainab T.A.2022.Epidemiological survey of periodontal diseases amongst patients attending the periodontics clinics at the college of dentistry, Albayan university, west of Baghdad, Iraq. Al-Bayan Journal for Medical and Health Sciences 1(2):83-88

7. Forner L, Larsen T, Kilian M, et al. Incidence of bacteremia after chewing, tooth brushingand scaling in individuals with periodontal inflammation. J Clin Periodontal 2006; 33:401-7

8. Tomas I, Diz P, Tobias A, et al. Periodontal health status and bacteraemia from daily oral activities: systemic review/meta-analysis. J Clin Periodontol 2012; 39:213-28

9. Christian Christian Damgaard, Suzanne G. Saekmose,Martin Nilsson, Mogens Kilian, Claus H.Nielsen, Palle Holmstrup. Periodontitis increases risk of viable bacteria in freshly drawn blood donations. Blood Transfus 2021.19(4) ; DOI : 10.2450/2021.0336-20

10. Grossi SG, Zambon JJ, Ho AW, Koch G, Dunford RG, Machtei EE, Norderyd OM, Genco RJ. Assessment of risk of periodontal disease. I. Risk indicators for attachment loss. J Periodontol. 1994 Mar;65(3):260-7.[Pubmed]

11. Joseph Fokam, Buolikeze Kuoh Nji Geh, Samuel Martin Sosso, Desire Takou, Ezechiel Semengue Ngufack, Alex Durand Nka, anne-Cecile Z.-K.Bissek, david Mindja Eko and Alexis Ndjolo BMC oral Health.2020;20:359. Determinants of periodontitis according to the immunological and virological profiles of HIV-infected patients in Yaoundé, Cameroon Doi: 10.1186/s 12903-020601353-7.

12. Thomas E. Van Dyke Risk factors for periodontitis J Int Acad Periodontol. 2005 Jan; 7(1):3-7.

13. Abegaz SB. Human ABO Blood Groups and Their Associations with Different Diseases. BioMed Res Int. Hindawi 2021; 2021:e6629060.

14. Al-Askar M. Is there an association between periodontal diseases and ABO blood group? Systematic review and meta-analysis. Quintessence Int 2022; 53:404–12.

15. Claude Tayou Tagny, amadou Diarra, Rakia Yahaya, Marc Hakizimana, Antoine Nguessan, Guy Mbensa, Yacouba Nébié, Honorine Dahourou, Dora Mbanya,

_____

Caroline Shiiboski, Edward Murphy, Jean Jacques Lefrère. Characteristics of blood donors and donated blood in sub-Saharan Francophone Africa.Transfusion 2009. 49 (8) p 1592-1599.

16. Ainamo , J.;I. Problems and proposals for recording gingivitis and plaque. Int. Dent. J. 1975,25, 229-235. [Google Scholar]

17. Lang, N.P. ; Bartold, P. M. Peridontal Health. J. Clin. Periodontal. 2018,45 (Suppl 20), 59-516. [Google Scholar] [CrossRef] [PubMed] [Green Version]

18. Chikte U, Pontes CC, Karangwa I, Kimmie-Dhansay F, Erasmus RT, Kengne AP, et al. Periodontal Disease Status among Adults from South Africa—Prevalence and Effect of Smoking. Int J Environ Res Public Health 2019;16:3662.

19. Wu Y, Dong G, Xiao W, Xiao E, Miao F, Syverson A, et al.Effect of aging on periodontal inflammation, microbial colonization, and disease susceptibility. J Dent Res. 2016; 95(4):460-6.

20. Umeizudike KA, Ayanbadejo PO, Savage KO, Akanmu AS, Emeka CI, Nwhator SO. Prevalence and determinants of chronic periodontitis in HIV positive patients in Nigeria. Asian Pacific J Trop Disease.2014;4:306-12

21. Franceschi C, Garagnani P, Morsiani C, Conte M, Santoro A, Grignolio A, et al. The continuum of aging and age-related diseases : common mechanisms but different rates. Front Med. 2018;5:61.

22. Pagou M. Santé buccodentaire des adultes (21 ans et plus) refugiés du camp de Minawao dans la région de l'Extrême-Nord du Cameroun. Undefined ;2017.https//www.paper/Sant%C3%A9-bucco-dentaire-des-adultes (21 ans et plus)-du-Pagou/b0f8847edbcb6b33d68422a5b04a53d55939fff 6.

23. Tomar SL, Swango PA, Kleinman DV, Burt BA. Loss of periodontal attachment in HIV-seropositive military personnel. J Periodontol.1995.https://doi.org/10.1902/jop.1995.66 .6.421.

24. MHD Ammar Kouki, Ali Abou Sulaiman, Mohammad Tawfik Kouki, Mohammed Monzer Alsabbagh.Investigation of ABO Blood Groups in Periodontal Status and its Effect on Level of response to Nonsurgical Periodontal Treatment.Journal of Clinical and Diagnostic Research. 2019 Jun , Vol-13(6): ZC36-ZC40

25. Patel R, Patel KM, Patel HN, Shah HG. ABO Blood Group &Periodontitis: Correlation or No-Relation. Ann Int Med Den Res. 2006;2: 251-54.

26. Francis DL, Raja BK, Krishnan L, Chandran CR. Association of ABO blood group and Rh factor with periodontitis among patients attending Tagore Dental College and Hospital: a cross-sectional study. European Journal of Biomedical and Pharmaceutical sciences. 2018;5(1):639-43.

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