Content available at: https://www.ipinnovative.com/open-access-journals

IP International Journal of Periodontology and Implantology

Journal homepage: https://www.ijpi.in/

Original Research Article

The relationship between periodontal diseases ABO blood group and Rh factor in Côte d'Ivoire: A retrospective cross-sectional pilot study

Gnaba Samson Mobio[1], Zocko Ange Désiré Pockpa[1]*, Habib Melaine Ebiba Assi[1], Naomi Delima Koffi[1], Nadin Thérèse Koffi-Coulibaly[1], Assem Soueidan[2], Camille Bechina[2], Xavier Struillou[2]

[1]Dept. of Periodontology, Dental College, Felix Houphouet Boigny University, Côte d'Ivoire.
[2]Dept. of Periodontology, Dental College, University of Nantes, Nantes, France

Abstract

Aim: In Côte d'Ivoire, some individuals appear to be more severely affected by periodontitis than others, suggesting the possible involvement of underexplored genetic risk factors. Recent studies have proposed a potential link between ABO blood group, Rhesus (Rh) factor, and periodontal diseases. This study aimed to evaluate the relationship between ABO and Rh blood group systems and periodontal diseases in a population from Côte d'Ivoire.

Materials and Methods: This cross-sectional pilot study analyzed the medical records of 561 participants (250 females, 311 males) who attended periodontal consultations at the Cocody University Hospital between January 2017 and December 2023. Participants were categorized into three groups healthy, gingivitis, and periodontitis according to the Chicago Classification criteria. ABO and Rh blood group information was collected via patient self-reports obtained through follow-up contacts. Data were analyzed using SPSS version 22.0 (SPSS Inc., Chicago, IL, USA) to assess correlations between blood group profiles and periodontal status.

Results: Among the 561 participants, the distribution of blood groups was as follows: O (49.9%), A (21%), B (16.4%), and AB (12.7%). Rh-positive individuals accounted for 94.5%, and Rh-negative for 5.5%. The distribution of periodontal status was 17.6% healthy, 57.8% with gingivitis, and 24.6% with periodontitis. A higher prevalence of gingivitis and periodontitis was observed among individuals with blood group O (53.1% and 44.9%, respectively) and Rh-positive status (94.44% and 94.21%, respectively); however, these associations were not statistically significant ($p = 0.398$ and $p = 0.063$, respectively).

Conclusion: This pilot study found no significant association between ABO or Rh blood group systems and periodontal diseases in the population studied in Côte d'Ivoire. Further large-scale, prospective research is warranted to confirm these findings and to explore potential genetic or immunological mechanisms involved.

Keywords: ABO blood group, Periodontal disease, Rh factor, Risk factors, Côte d'Ivoire

Received: 13-04-2025; **Accepted:** 11-06-2025; **Available Online**: 07-07-2025

1. Introduction

Periodontal diseases are chronic, multifactorial inflammatory conditions linked to dysbiotic plaque biofilms and characterized by the destruction of tooth-supporting structures.[1] These diseases represent a significant public health concern due to their high prevalence and consequences such as tooth loss, impaired chewing, aesthetic issues, social inequality, and reduced quality of life.[1]

The severity and response to treatment vary greatly among individuals, influenced by numerous risk factors—genetic, environmental, and behavioral. Genetic susceptibility plays a central role in the pathogenesis of periodontal diseases, often reflected in traits like ethnicity, gender, and heredity[2]. Notably, ABO blood group antigens have been used as genetic markers to explore associations with various diseases.[2-5]

The ABO and Rhesus blood group systems classify human blood based on antigen presence on red blood cells. The ABO system includes four types: A, B, AB, and O, depending on the presence or absence of A and B antigens.[6] The Rhesus system is defined by the presence (positive) or absence (negative) of the D antigen. While these systems are

*Corresponding author: Zocko Ange Désiré Pockpa
Email: angepockpa2013@gmail.com

https://doi.org/10.18231/j.ijpi.2025.018

critical in transfusion medicine, they may also influence susceptibility to infections and chronic diseases, including periodontal diseases.[6,7]

Blood group antigens can act as receptors or co-receptors for microorganisms and affect immune responses, influencing disease susceptibility.[8] For instance, blood type O is thought to confer protection against cardiovascular disease and severe COVID-19, while type A has been associated with greater Angiotensin-Converting Enzyme activity and inflammation. Additionally, the susceptibility of several diseases (infectious diseases, circulatory diseases, metabolic diseases, cancer, metabolic diseases malaria) have been associated with ABO blood groups.[9-13] Diabetes mellitus may be very common in people with blood groups A and O.[14]

The potential link between ABO blood groups and periodontal health was first proposed in the 1970s.[15,16] Since then, studies have explored this relationship, though findings remain inconsistent, likely due to geographic and population differences.[17,18] In Côte d'Ivoire, no data currently exist on this topic. Therefore, the present study aims to assess the relationship between ABO and Rh blood groups and periodontal diseases in the Ivorian population.

2. Materials and Methods

2.1. Study design and ethical approval

This retrospective study was conducted using medical records of patients who received periodontal consultations at the Department of Periodontology, Cocody University Hospital in Abidjan, between January 2017 and December 2023. The study protocol was approved by the Scientific and Ethical Committee of the Odontostomatology Training and Research Unit at the University Félix Houphouët-Boigny in Abidjan (authorization number 520/24).

2.2. Inclusion and exclusion criteria

The study included medical records of patients who voluntarily participated, had complete clinical data, and presented with at least 20 natural teeth (excluding third molars). Records were excluded if patients were unreachable, unaware of their blood group, or declined participation.

2.3. Data collection and diagnostic criteria

Data extracted from the medical records included both socio-demographic variables (age, gender, socioeconomic status, lifestyle and oral hygiene habits) and periodontal clinical parameters, namely: Plaque Index (PI).,Bleeding on Probing (BOP), Number of missing teeth, Probing Depth (PD), Gingival Recession (REC), Clinical Attachment Loss (CAL).

Clinical examinations were performed using a William's periodontal probe (Michigan O probe, Hu-Friedy Mfg. Co., Chicago, IL, USA). All fully erupted permanent teeth, excluding third molars, were evaluated at six sites per tooth: mesiobuccal, mid-buccal, distobuccal, mesiolingual, mid-lingual, and distolingual. PD was defined as the distance from the free gingival margin to the base of the pocket. REC was measured from the cementoenamel junction to the free gingival margin. CAL was calculated as the sum of PD and REC.

Based on the clinical criteria established by the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions (Chicago Classification), patients were categorized into three diagnostic groups:[1,19]

1. Group I (Healthy): BOP <10%, PD <3 mm, no clinical attachment loss
2. Group II (Gingivitis): BOP ≥10%, PD <3 mm, no clinical attachment loss
3. Group III (Periodontitis): Interdental attachment loss at ≥2 non-adjacent teeth with PD ≥4 mm

Information regarding ABO blood group and Rhesus factor (Rh) was obtained through self-reporting by recontacting patients. Participants were categorized according to their blood group (A, B, AB, or O) and Rh status (positive or negative).

2.4. Statistical analysis

Descriptive statistics were used to determine the distribution of ABO and Rh blood groups across the periodontal diagnostic groups. The Chi-square test was employed to compare the distributions between groups. A p-value of less than 0.05 was considered statistically significant.

3. Results

Between January 2017 and December 2023, a total of 1,917 clinical records were identified. Of these, 908 were excluded due to incomplete data. Among the remaining 1,009 eligible files, 448 were excluded for the following reasons: participants were unreachable (n = 276), declined to participate (n = 35), or were unaware of their blood group (n = 137). Ultimately, the study included data from 561 participants (250 females and 311 males), aged between 15 and 86 years, with a mean age of 38.28 ± 14.25 years (**Figure 1**).

Socio-demographic characteristics showed that the majority of participants were over 35 years old, predominantly male (55.4%), and from a low socio-economic background (54%).

Periodontal assessment revealed that 97.5% of the participants had poor oral hygiene. The distribution of periodontal status was as follows:

1. Healthy individuals: 17.6%
2. Gingivitis: 57.8%
3. Periodontal disease: 24.6% (**Figure 2**)

Blood group distribution among participants was as follows:

1. Group O: 49.9%
2. Group A: 21%
3. Group B: 16.4%
4. Group AB: 12.7%

With regard to the Rhesus factor, 94.5% were Rhesus positive, and 5.5% were Rhesus negative (**Figure 3**).

In terms of periodontal disease prevalence by blood group, individuals with blood group O showed the highest incidence, followed by those with group A. Among group O subjects, 53.08% were affected by gingivitis and 44.92% by periodontal disease. Regarding the Rhesus system, individuals with a positive Rhesus factor were more frequently affected by gingivitis (94.44%) and periodontal disease (94.21%) (**Table 1**).

Inferential statistical analysis revealed that, although gingivitis and periodontal disease were more prevalent among individuals with blood group O and Rhesus positive status, there was no statistically significant association between periodontal diseases and the ABO blood group (p = 0.398) or the Rhesus factor (p = 0.063) (**Table 1**).

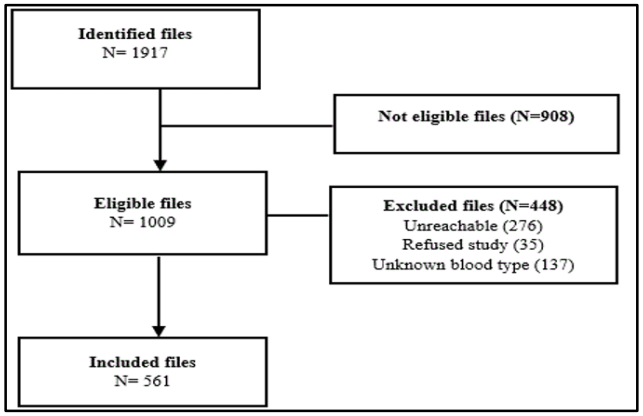


Figure 1: Flow chart.

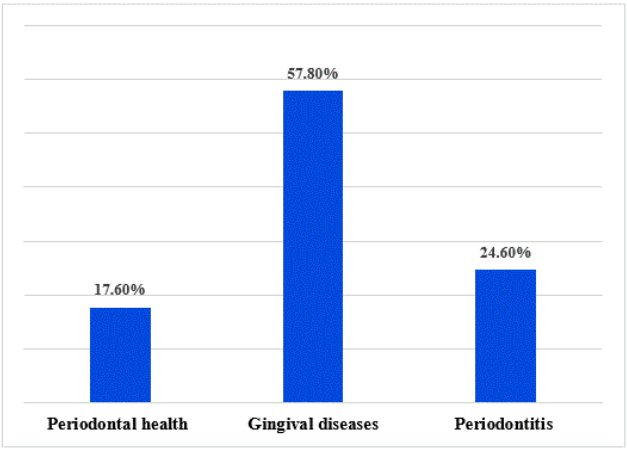
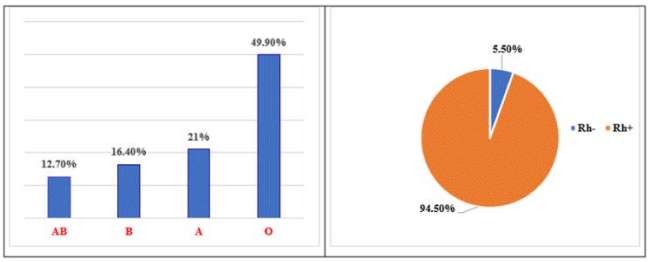


Figure 2: Periodontal status in study population



Rh-: Rh negative; Rh+: Rh positive; p: p-value

Figure 3: Distribution of blood and Rh Factor group in study population

Table 1: Percentage distribution of blood groups, Rh factor among healthy individuals, patients with gingivitis, and patients with periodontitis (N=561)

	Periodontal health (N=99;17.6%)	**Gingival diseases (N=324, 57.8%)**	**Periodontitis (N=138; 24.6%)**	**Total sample (N=138; 24.6%)**	**p-value**
Variables					
Blood group					
A	24 (24.2)	67 (20.7)	27 (19.6)	118 (21)	**0.398**
AB	11 (11.1)	36 (11.1)	24 (17.4)	71 (12.70)	
B	18 (18.2)	49 (15.1)	25 (18.1)	92 (16.40)	
O	46 (46.5)	172 (53.1)	62 (44.9)	280 (49.90)	
Rh Factor					
Rh-	5 (5.05)	18 (5.56)	8 (5.79)	31 (5.5)	0.063
Rh+	94 (94.95)	306 (94.44)	130 (94.21)	530 (94.5)	

Rh-: Rh negative; Rh+: Rh positive; p: p-value

4. Discussion

Numerous studies have established that the presence of oral biofilm is a prerequisite for the development of periodontal diseases.[2,5,20] The progression and severity of these conditions are influenced by a range of risk factors. These can be classified into modifiable factors such as smoking, poor oral hygiene, diabetes mellitus, pregnancy and non-modifiable factors, including age, heredity, and genetic predisposition.[21,22] Prevention and treatment strategies for periodontal disease primarily focus on managing these risk factors.

In the present study, no statistically significant association was found between periodontal disease including both gingivitis and periodontitis and the ABO blood group system. Similarly, no significant correlation was observed between periodontal disease and the Rhesus blood group system.[2,5,22]

These findings are consistent with those of previous studies.[16,23,24] For example, in 2021, Al-Askar et al.[24] reported a higher prevalence of blood group O among individuals with periodontal disease; 46.8% among those with gingivitis and 49.6% among those with periodontitis. Despite this, the authors concluded that there was no significant association between ABO blood groups and periodontal disease24. This was further supported by a meta-analysis indicating that blood group O was the most frequently observed among individuals with periodontal disease (39.0%; 95% CI: 0.35–0.43). Regarding the Rhesus factor, 90.7% of patients were Rh-positive (95% CI: 0.89–0.92), while 9.2% were Rh-negative (95% CI: 0.06–0.13). Fixed-effects analysis revealed no statistically significant link between ABO or Rhesus blood groups and periodontal disease.[25]

However, contrasting findings have been reported in other studies, which demonstrated a significant association between ABO and Rhesus blood groups and periodontal disease.[26-31] These studies found that individuals with blood group O and Rh-positive status may be more susceptible to developing periodontal diseases.[26-31] This potential association may be explained by the role of blood group antigens as receptors for pathogenic microorganisms involved in periodontal infections.[15,16,31] Furthermore, the secretion of ABO antigens in saliva may inhibit microbial adhesion to tooth surfaces.

The biological mechanisms underlying these associations may depend on tissue-specific expression of blood group antigens and an individual's secretor status. Secretor status has been shown to significantly influence oral health, particularly within stratified epithelial tissues.[32-35] Non-secretors generally exhibit reduced salivary levels of immunoglobulin A (IgA) which may compromise their ability to control oral bacterial colonization, thereby increasing their susceptibility to oral diseases32–35. The expression of A/B antigens in oral tissues is determined by the activity of glycosyltransferases and the availability of appropriate substrates.[15,16,31] Individuals with blood group O lack functional A and B glycosyltransferases and instead express a fucosylated precursor structure (Lewis^y antigen), which may partially explain their increased vulnerability to periodontal infections.[15,16,31]

This study has certain limitations. Its retrospective design and reliance on self-reported ABO and Rhesus blood group information may introduce bias. Additionally, the high proportion of individuals with blood group O (49.9%) and Rh-positive status (94.5%) in the study population may have influenced the distribution of results. However, these figures are consistent with the general population distribution in Côte d'Ivoire. A previous large-scale study involving 11,200 individuals from the same region reported similar proportions, with 48.1% blood group O and 94.7% Rh-positive.[36]

One of the main strengths of this study lies in its relatively large sample size, which contributes to the robustness of the findings and enriches the limited epidemiological data available on this topic in African populations. To date, the only similar study conducted in Africa was by Arowojolu et al,[37] who investigated the association between periodontal disease and ABO blood groups in a cohort of 40 Nigerian adolescents (20 with juvenile periodontitis and 20 with chronic periodontitis). The study revealed a significant association between blood groups B/AB and Rh-positive status and juvenile periodontitis ($p < 0.05$), a severe form of periodontal disease according to older classifications.[37]

5. Summary of Key Findings

As a pilot study, this investigation sought to explore potential associations between periodontal diseases and the ABO/Rhesus blood group systems within a specific population. Although a higher prevalence of gingivitis and periodontitis was observed among individuals with blood group O and Rh-positive status, statistical analysis did not reveal any significant association between these blood group systems and periodontal disease. These preliminary findings align with several previous studies, suggesting that, despite the overrepresentation of certain blood types among affected individuals, ABO and Rhesus blood groups do not appear to be independent risk factors.

The observed distribution of blood groups in this sample is consistent with national data for Côte d'Ivoire, which strengthens the representativeness of the findings despite the limitations inherent to a pilot study design. Moreover, while biological mechanisms involving blood group antigens such as their role in bacterial adhesion or immune response modulation remain theoretically plausible, they were not substantiated by the results of this study.

Overall, these pilot findings reinforce the complex, multifactorial etiology of periodontal diseases, which appear to be more strongly influenced by modifiable risk factors such as oral hygiene, systemic conditions, and behavioral habits. Further large-scale, prospective studies are needed to confirm these observations and to explore potential gene-environment interactions more thoroughly in African populations.

6. Conclusion

This pilot study found no significant association between ABO and Rhesus blood groups and periodontal diseases in the studied population in Côte d'Ivoire. While blood group O and Rh-positive individuals were more frequently affected, these blood group systems do not appear to constitute independent risk factors for periodontal conditions. To validate and expand upon these findings, future prospective studies with larger, more diverse populations from different geographical regions are warranted.

Nevertheless, recording patients' ABO and Rhesus blood group information during clinical examinations in periodontal settings may still be useful for future research and epidemiological monitoring, especially in regions where data remain limited.

7. Conflict of Interest

None.

8. Source of Funding

None.

References

1. Papapanou PN, Sanz M, Buduneli N, Dietrich T, Feres M, Fine DH, et al. Periodontitis: Consensus report of workgroup 2 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. *J Periodontol*. 2018;89(1):S173–82.
2. Genco RJ, Borgnakke WS. Risk factors for periodontal disease. Periodontology 2000. 2013;62(1):59–94.
3. Abegaz SB. Human ABO Blood Groups and Their Associations with Different Diseases. *Biomed Res Int*. 2021;2021:6629060.
4. Groot HE, Villegas Sierra LE, Said MA, Lipsic E, Karper JC, van der Harst P. Genetically Determined ABO Blood Group and its Associations with Health and Disease. *Arterioscler Thromb Vasc Biol*. 2020;40(3):830–8.
5. Bouchard P, Carra MC, Boillot A, Mora F, Rangé H. Risk factors in periodontology: a conceptual framework. *J Clin Periodontol*. 2017;44(2):125–31.
6. Franchini M, Liumbruno GM. ABO blood group: old dogma, new perspectives. *Clin Chem Lab Med (CCLM)*. 2013;51(8):1545–53.
7. Li HY, Guo K. Blood Group Testing. *Front Med (Lausanne)*. 2022;9:827619.
8. Cooling L. Blood Groups in Infection and Host Susceptibility. *Clin Microbiol Rev*. 2015;28:801–70.
9. Sb A. Human ABO Blood Groups and Their Associations with Different Diseases. *BioMed Res Int*. 2021;2021:6629060.
10. Dai X. ABO blood group predisposes to COVID-19 severity and cardiovascular diseases. *Eur J Prev Cardiol*. 2020;27(13):1436–7.
11. Cm C, Wh D. The ABO blood group system and Plasmodium falciparum malaria. *Blood*. 2007;110(7):2250-8.
12. Dj A. The relationship between blood groups and disease. *Blood*. 2010;115(23):4635-43.
13. Amirzadegan A, Salarifar M, Sadeghian S, Davoodi G, Darabian C, Goodarzynejad H. Correlation between ABO blood groups, major risk factors, and coronary artery disease. *Int J Cardiol*. 2006;110(2):256-8.
14. Okon UA, Antai AB, Osim EE, Ita SO. The relative incidence of diabetes mellitus in ABO/Rhesus blood groups in South-Eastern Nigeria. *Niger J Physiol Sci*. 2008;23(1-2):1–3.
15. Kaslick RS, Chasens AI, Tuckman MA, Kaufman B. Investigation of periodontosis with periodontitis: literature survey and findings based on ABO blood groups. *J Periodontol*. 1971;42(7):420–7.
16. Pradhan AC, Chawla TN, Samuel KC, Pradhan S. The relationship between periodontal disease and blood groups and secretor status. *J Periodontal Res*. 1971;6(4):294–300.
17. Al-Askar M. Is there an association between periodontal diseases and ABO blood group? Systematic review and meta-analysis. *Quintessence Int*. 2022;53(5):404–12.
18. Pai GP, Dayakar MM, Shaila M, Dayakar A. Correlation between "ABO" blood group phenotypes and periodontal disease: Prevalence in south Kanara district, Karnataka state, India. *J Indian Soc Periodontol*. 2012;16:519–23.
19. Caton JG, Armitage G, Berglundh T, Chapple ILC, Jepsen S, Kornman KS, et al. A new classification scheme for periodontal and peri-implant diseases and conditions - Introduction and key changes from the 1999 classification. *J Clin Periodontol*. 2018;45 Suppl 20:S1–8.
20. Rj G, Ws B. Risk factors for periodontal disease. *Periodontology* 2000;62:59–94 .
21. Van Dyke TE, Dave S. Risk Factors for Periodontitis. J Int Acad Periodontol. 2005;7(1):3–7.
22. Gasner NS, Schure RS. Periodontal Disease. In: StatPearls. Treasure Island (FL): StatPearls Publishing. [Accessed June 20, 2024] Available from: http://www.ncbi.nlm.nih.gov/books/NBK554590/. 2024.
23. Frías MT, López NJ. No association between secretor status of ABO blood group antigens and juvenile periodontitis. *Acta Odontol Latinoam*. 1994;8(2):9–15.
24. Al-Askar M, AlMoharib HS, Alaqeely R, Talakey AA, Alzoman H, Alshihri A. The Relationship Between Periodontal Disease and ABO Blood Groups: A Cross-Sectional Study. *Oral Health Prev Dent*. 2021;19:295–9.
25. Al-Askar M. Is there an association between ABO blood grouping and periodontal disease? A literature review. *Interv Med Appl Sci*. 2017;9(3):164–7.
26. Gawrzewska B. ABO, Rh and MN blood groups systems and ABH group factors in saliva as related to parodontal diseases. *Czas Stomatol*. 1975;28(10):1007–14.
27. Demir T, Tezel A, Orbak R, Eltas A, Kara C, Kavrut F. The Effect of ABO Blood Types on Periodontal Status. *Eur J Dent*. 2007;1(3):139–43.
28. Vivek S, Jain J, Simon SP, Battur H, Supreetha S, Haridas R. Association of ABO Blood Group and Rh factor with Periodontal Disease in a Population of Virajpet, Karnataka: A Cross-Sectional Study. *J Int Oral Health*. 2013;5(4):30–4.
29. Koregol AC, Raghavendra M, Nainegali S, Kalburgi N, Varma S. ABO blood groups and Rhesus factor: an exploring link to periodontal diseases. *Indian J Dent Res*. 2010;21(3):364–8.
30. Anup P, Siddhartha V, Girish S, Keshava A, Sameer Z, Vishwajeet K. ABO and Rh Blood Group System and Periodontal Disease - A Prevalence Study. *J Adv Med Med Res*. 2016;16(5):1–6.
31. Mostafa D, Elkhatat EI, Koppolu P, Mahgoub M, Dhaifullah E, Hassan AH. Correlation of ABO Blood Groups and Rh Factor with The Severity of Generalized Chronic Periodontitis: Across Sectional Study in Riyadh, Saudi Arabia. *Open Access Maced J Med Sci*. 2019;7(4):617–22.
32. Rai P, Acharya S, Hallikeri K. Assessment of ABO blood grouping and secretor status in the saliva of the patients with oral potentially malignant disorders. *J Oral Maxillofac Pathol*. 2015;19(2):164–9.

33. Walpola T, Jayawardene KLTD, Weerasekara I. The secretor status of blood group antigens in the saliva in people with oral cancers: a systematic review. *Syst Rev*. 2024;13(1):13.
34. Metgud R, Khajuria N, Mamta, Ramesh G. Evaluation of the Secretor Status of ABO Blood Group Antigens in Saliva among Southern Rajasthan Population Using Absorption Inhibition Method. *J Clin Diagn Res*. 2016;10(2):ZC01–3.
35. Li Y, Jin L, Chen T. The Effects of Secretory IgA in the Mucosal Immune System. *Biomed Res Int*. 2020;2020:2032057.
36. Dulat C, Rey JL, Trolet C. Répartition ethnique des groupes sanguins en Côte d'Ivoire. *Bulletin de la Société Médicale d'Afrique Noire de Langue Française*. 1989;36(II):880–90.
37. Arowojolu MO, Dosmu EB, Adingbola TS. The relationship between juvenile and non-juvenile periodontitis, ABO blood groups and haemoglobin types. *Afr J Med Med Sci*. 2002;31(3):249–52.

Cite this article: Mobio GS, Pockpa ZAD, Assi HME, Koffi ND, Koffi-Coulibaly NT, Soueidan A, Bechina C, Struillou X. The relationship between periodontal diseases ABO blood group and Rh factor in Côte d'Ivoire: A retrospective cross-sectional pilot study. *IP Int J Periodontol Implantol*. 2025;10(2):87-92