# Journal of Population Therapeutics & Clinical Pharmacology

# MICROBIOLOGICAL PROFILE OF PERIODONTITIS ASSOCIATED WITH CARDIOVASCULAR DISEASES: STUDY CARRIED OUT BY CONVENTIONAL PCR AT THE PERIODONTOLOGY DEPARTMENT-CHU TLEMCEN-ALGERIA

**Zouaoui.A[1*], Meziane Tani. A[2], Bouziane.D.[3]**

[1*,2,3]Professeure Zouaoui Amel (A lecturer in periodontology - Abou Bekr Belkaid University-Tlemcen-Algeria-Faculty of Medicine Doctor Benzerdjeb Benaouda -Department of dentistry)
Address: City of 50 housing units – Ain Nouissy-Mostaganem 270000-Algeria
Email address: zouaoui.amel27@gmail.com

**\*Corresponding Auhtor:** Zouaoui. A
\*Professeure Zouaoui Amel (A lecturer in periodontology - Abou Bekr Belkaid University-Tlemcen-Algeria-Faculty of Medicine Doctor Benzerdjeb Benaouda -Department of dentistry)Address: City of 50 housing units – Ain Nouissy-Mostaganem 270000-Algeria
Email address: zouaoui.amel27@gmail.com

**Summary:**
**Introduction/Problem:** Periodontitis, a multifactorial chronic inflammatory disease, is one of the most widespread oral diseases. Source of numerous complications, general, including cardiovascular diseases with an "atherosclerotic" ischemic component.
So what are the different bacterial species that could be involved in this association ?
It is to answer this question that we have chosen to address this theme.

**Objective :**Describe the bacterial species associated with periodontitis and cardiovascular diseases.

**Materials/Method :**This was a cross-sectional descriptive study, carried out at the periodontology department -CHU Tlemcen-Algeria, for the period (June 1, 2018 - September 1, 2018).
Cardiovascular risk was determined via C-reactive ultra-sensitive protein (CRPus) by nephelometry. Microbiological samples were taken from the periodontal pockets using sterile paper cones.
The identification was carried out by classic Polymerase Chain Reaction (PCR) at the laboratory level: Gene Life Sciences (Sidi Belabess-Algeria), Biofidal (Vaulx-en-Velin –France).

**Results/Discussion:** Our study enabled the enrollment of 19 patients and therefore obtained 19 samples (n=19).
Axial CRPus ranged between (0.20 – 9.45) mg/L with a mean of (2.0721 ± 0.61) mg/L.
A CRPus > 3 mg/L reflecting severe cardiovascular risk was found in fours participants.
Generalized stage IV periodontitis grade C was the most diagnosed (07 cases).
The following species were recorded:
*Porphyromonas gingivalis, Parvimonas micra, Tannerella forsythia, Fusobacterium nucleatum, Eubacterium nodatum, Treponema denticola*, *Prevotella intermedia, Eikenella corrodens, Aggregatibacter actionomycetemcomitans.*

---

The species listed in all patients at high cardiovascular risk were: Td, Pi, Pg, Fn, Tf, Aac: *Td, Pi ,Pg ,Fn, Tf, Aac*.

**Conclusion /Recommandations :** We hope that our modest results will encourage further studies, making it possible to flesh out the microbiological aspect of the association of periodontal disease and cardiovascular diseases as complex as it is relevant.

**Key words**: periodontitis-cardiovascular disease-microbiological aspect.

**Introduction/Problem :**
Periodontitis is defined as a multifactorial chronic inflammatory disease, associated with a dysbiotic biofilm characterized by the progressive destruction of the tooth supporting apparatus. They are among the most common non-communicable diseases in humans (1),(2).
Periodontitis can present numerous complications, local such as edentulism and the resulting aesthetic and functional damage with the deterioration of self-image and self-confidence, but also general, in many situations including cardiovascular diseases., especially with an ischemic component (atherosclerosis). Thus, periodontitis represents a real public health burden (3),(4),(5).
So what are the different bacterial species that can be involved in this process ?
It is to answer this question that we have chosen to address this theme.

**Objective :**
Highlight the different bacterial species associated with periodontitis and cardiovascular diseases.

**Materials/Method :**
This was a cross-sectional descriptive study, carried out in the periodontology department of the university hospital center (CHU) of Tlemcen-Algeria, ranging from the period from June 1, 2018 to September 1, 2018.
The sampling was carried out on a systematic recruitment of patients attending our consultations, meeting our inclusion and non-inclusion criteria.
Inclusion criteria: Affected by CVD confirmed by a cardiologist, female, male, aged 16 and over, dentate (presenting 30% of teeth or more).
Non-inclusion criteria: Affected by another disease, presenting obesity, smokers, having benefited from periodontal treatment, or based on antibiotics, antiseptics, immunosuppressants in the three months preceding recruitment, those not cooperating with the study and pregnant women.
The different indices and parameters studied were: the gingival inflammation index or the gingival index (GI) of Silness and Löe, the depth of the periodontal pockets, the loss of attachment as well as the CAOD index of Klein and Palmer (6),(7).

**Cardiovascular risk was determined via C-reactive ultra-sensitive protein (CRPus), by nephelometry from blood samples, as follows:**
- CRPus values < 1 mg/l represented a low cardiovascular risk;
- CRPus values between 1-3 mg/l represented a moderate cardiovascular risk;
- CRPus values > 3 mg/l represented a severe cardiovascular risk (8).
Microbiological samples were taken from the periodontal pockets using sterile paper cones.
After isolating the sampling site using saliva cotton, the sterile paper cones were introduced at the most affected sites (presenting the most significant loss of attachment) for 20 seconds, to be transferred into cryovials. containing 200 microliters of sterile TE transfer solution, and stored at a temperature of (– 10°c).
The identification was carried out by classic PCR at the laboratory level: Gene Life Sciences (Sidi Belabess-Algeria), Biofidal (Vaulx-en-Velin –France).

**Results/Discussion :**

The age of our patients ranged from 23 to 72 years, with a mean of (51.73 ± 3.15) years and a standard deviation of 13.74. The most represented age group was that between 50 -60 years (7 cases), then that between 60 -70 years (5 cases).

The male sex was the most prevalent (12 cases), giving a sex ratio of 1.71.

Arterial hypertension was the most common cardiovascular disease (11 cases) followed by coronary syndrome (2 cases).

Axial CRPus ranged between (0.20 – 9.45) mg/l with an average of (2.0721±0.61) mg/l.

A CRPus ≤ 1 mg/l in favor of a low cardiovascular risk was the most found (14 cases), followed by a CRPus > 3 mg/l (4 cases) reflecting a severe cardiovascular risk and finally the CRPus between 1-3 mg/l in favor of moderate cardiovascular risk (01 cases).

Concerning the periodontal parameters, the GI varied between 2 – 3 with an average of 2.09 ± 0.06.

The periodontal pocket depth was between (2 - 6.90) mm with an average of (4.01 ± 0.26) mm.

The attachment loss was between (0.26 - 5.29) mm with an average of (2.50 ± 0.32)mm.

The average CAOD was 13 ± 1.16 in favor of a very high level of caries damage.

Stage IV generalized periodontitis grade C was the most common (07 cases), followed by generalized stage IV periodontitis grade B (5 cases).

**The following species have been identified:**

*Treponema denticola (Td) (*12 samples), *Prevotella intermedia (Pi) (*11 samples), *Porphyromonas gingivalis(Pg) (*18 samples), *Eikenella corrodens (Ec) (*11 samples), *Fusobacterium nucleatum(Fn) (*14 samples), *Tannerella forsythia(Tf) (*15 samples), *Aggregatibacter actionomycetemcomitans(Aac) (*10 samples), *Eubacterium nodatum(En)* *(*14 samples), *Parvimonas micra(Pm) (*17 samples).

Our results are closest to those described by Bozoglan et al (Turquie-2017) (9) , where with the exception of Capnocytophaga sputigena (Cs), the same species were practically recorded, namely: *Aac, Pg , Tf, Td, Pi, ,Fn, Campylobacter rectus(Cr),* although with the absence of Ec and Pm.

Figuero et al also through his study ( Espagne – 2011)(10) described the presence of certain species found in our study (Pg, Ec, Fn, Tf), and the absence of others (Td, Pi, En , Pm).

Liljestrand et al (Finlande 2017)(11), was also able to highlight the following species (Pi, Pg, Tf, Aac), with the absence of others (Td, Ec, En, Pm). The population studied , with certainly a different microbiota, as well as the type of periodontitis seem to offer the most rational explanations for this contrast..

- Depending on the periodontitis mentioned in our study, the different species were distributed as
- follows:
- o Td was more associated with generalized stage IV periodontitis-Grade B (5 samples) and
- o generalized stage IV periodontitis-Grade C (5 samples);
- o Pi was more associated with generalized periodontitis IV-Grade C (5 samples), followed by
- o generalized stage IV periodontitis-Grade B (3 samples);
- o Pg was more associated with generalized stage IV periodontitis-Grade C (7 samples), followed by
- o generalized stage IV periodontitis-Grade B (5 samples);
- o Ec was more associated with generalized stage IV periodontitis-Grade B (4 samples), followed by generalized stage IV periodontitis-Grade C (3 samples);
- o Fn was more associated with generalized stage IV periodontitis - Grade C (7 samples), followed by localized stage IV periodontitis - Grade B (2 samples) and localized stage IV periodontitis - Grade C (2 samples);
- o Tf was more associated with generalized stage IV periodontitis-Grade C (7 samples), followed by generalized stage IV periodontitis-Grade B (4 samples);
- o Aac was more associated with generalized stage IV periodontitis-Grade C (6 samples), followed by localized stage IV periodontitis-Grade B (2 samples);

o En was more associated with generalized stage IV periodontitis-Grade C (5 samples), followed by generalized stage IV periodontitis-Grade B (4 samples);
o Pm was more associated with generalized stage IV periodontitis-Grade C (6 samples), followed by generalized stage IV periodontitis-Grade B (5 samples);
▪ The species found in all patients at high cardiovascular risk were :*Td, Pi ,Pg ,Fn, Tf, Aac*.

## Conclusion /Recommandations :

Our study reveals the infectious nature of periodontitis, particularly those associated with cardiovascular diseases. The species most correlated with high cardiovascular risk were: Td, Pi, Pg, Fn, Tf, Aac.

We nevertheless hope that our modest results will encourage many others, allowing us to expand knowledge on the association of periodontal disease and cardiovascular diseases, which is both complex and relevant.

## Bibliography :

1. Bouchard P. Parodontologie & Dentisterie Implantaire. Volume 1. Lavoisier; 2015.
2. Sanz M, Herrera D, Kebschull M, Chapple I, Jepsen S, Berglundh T, et al. Treatment of stage I–III periodontitis—The EFP S3 level clinical practice guideline. J Clin Periodontol. juill 2020;47(S22):4-60.
3. Pompignoli M, Doukhan JY, Raux D, Irsa A. Prothèse complète: clinique et laboratoire. Éditions CdP; 2017.
4. Tonetti MS, Van Dyke TE, on behalf of working group 1 of the joint EFP/AAP workshop. Periodontitis and atherosclerotic cardiovascular disease: consensus report of the Joint EFP/AAPWorkshop on Periodontitis and Systemic Diseases. J Periodontol. avr 2013;84(4S).
5. Zardawi F, Gul S, Abdulkareem A, Sha A, Yates J. Association Between Periodontal Disease and Atherosclerotic Cardiovascular Diseases: Revisited. Front Cardiovasc Med. 15 janv 2021;7:1-17.
6. Vigouroux F, Da Costa-Noble R, Verdalle PM, Colomb R. Guide pratique de chirurgie parodontale. Elsevier Masson; 2011.
7. Guide clinique d'odontologie. 2e édition. Elsevier-Masson; 2014.
8. Caquet René. Analyses de laboratoire en odontostomatologie. Elsevier Masson; 2012.
9. Bozoglan A, Ertugrul AS, Taspınar M, Yuzbasioglu B. Determining the relationship between atherosclerosis and periodontopathogenic microorganisms in chronic periodontitis patients. Acta Odontol Scand. 19 mai 2017;75(4):233-42.
10. Figuero E, Sánchez-Beltrán M, Cuesta-Frechoso S, Tejerina JM, Del Castro JA, Gutiérrez JM, et al. Detection of Periodontal Bacteria in Atheromatous Plaque by Nested Polymerase Chain Reaction. J Periodontol. oct 2011;82(10):1469-77.
11. Liljestrand JM, Paju S, Pietiäinen M, Buhlin K, Persson GR, Nieminen MS, et al. Immunologic burden links periodontitis to acute coronary syndrome. Atherosclerosis. janv 2018;268:177-84.