

Impact of different settings in periodontitis prevalence

Impacto das diferentes definições na prevalência de periodontite

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ABSTRACT

Methods: The sample consisted of 200 pregnant women from a database. A Medline search was conducted to identify studies that evaluated the association between periodontitis and gestational diabetes. Periodontitis case definitions used in the retrieved studies were applied in the sample. The frequency of periodontitis among the different diagnostic criteria was compared through the Chi-square test. **Results:** After conducting a search, analysis, and selection from the literature, nine studies were included in the present study. Three studies showed the same criteria. As a result, seven different periodontitis definitions were identified. The frequency of periodontitis in the sample ranged from 24.5% to 72.5%. **Conclusion:** The prevalence of periodontitis greatly varies when different diagnostic criteria are used. The standardization of periodontitis case definitions in epidemiological studies is crucial for a better comparison among the studies and improvement of the results.

Uniterms: Gestational diabetes. Periodontitis. Epidemiology.

INTRODUCTION

Periodontitis is a chronic infectious disease which leads to an inflammatory process of the periodontal tissues. It is clinically characterized by changes in probing depth, attachment loss, and bleeding on probing, which may progress to advanced bone destruction, and, consequently, to tooth loss¹.

Biofilms play a fundamental role in the triggering of inflammation in the gingival tissue. This immune and inflammatory host response to bacterial invasion is the main cause of the destruction of periodontal tissue observed in periodontitis^{2,3}.

The infectious and inflammatory nature of periodontitis and its possible systemic effects have guided different association studies between periodontitis and several systemic conditions, such as cardiovascular disease, pregnancy, diabetes, and respiratory infections⁴⁻⁹.

However, the criteria used to define periodontitis greatly vary in scientific literature, reflecting important changes in the prevalence of periodontitis¹⁰. There is no consensus on a uniform periodontitis definition in epidemiological research.

The aim of the present study was to assess and analyze the impact of different diagnostic criteria on the prevalence of periodontitis in a population of pregnant women.

MATERIAL AND METHODS

Sampling strategy

This sample of the present cross-sectional study is comprised of 200 pregnant women, randomly selected from a database of two previous studies from our research group.^{4,7} Participants were from the same maternity hospital in the city of Belo Horizonte, Brazil.

The established inclusion criteria were: pregnant women over 18 years of age, single pregnancy, gestational age greater than 28 weeks, presence of at least 12 teeth in the oral cavity, and absence of contraindications for the periodontal examination. Exclusion criteria included cases of women undergoing antibiotic therapy or periodontal therapy in the three months prior to the clinical examination, presence of type 1 diabetes mellitus (DM-1) or type 2 diabetes mellitus (DM-2), and

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serologically human immunodeficiency virus positive women.

All participants provided a written informed consent. The present study was approved by the Ethics Research Committee of the Federal University of Minas Gerais (ETIC 0096.0.287.203-09).

Periodontal clinical examination

Subjects underwent to a full mouth periodontal clinical examination. Circumferential periodontal probing was manually performed with a University of North Carolina (UNC)-15 periodontal probe (Hu Friedy, Chicago, IL, USA). Periodontal parameters including probing depth (PD), clinical attachment level (CAL), and bleeding on probing (BOP) were measured at four sites per tooth (mesial, distal, lingual, and buccal).

All measurements were performed by two trained and calibrated periodontists (LOMC and RPEL). Inter and intra-examiner reliability, assessed by weighted k coefficients, were 0.90 for PD and 0.88 for CAL.

Periodontitis case definition

An electronic search was performed using the Medline database to identify studies that evaluated the association between periodontitis and gestational diabetes. Studies published up to December 2015, with no restrictions to date or to publication language, were selected. The search strategy combined the following Mesh terms: “periodontitis” AND “diabetes, gestational”. All the studies identified by this electronic

search were initially reviewed and selected by reading the title and abstract. After the initial selection, studies were analyzed in full for confirmation of their inclusion. Epidemiological studies that presented data on the frequency of periodontitis in women with gestational diabetes mellitus were included. Reviews and meta-analysis were excluded. Studies that did not report a defined criteria for periodontitis definition were also excluded. The different diagnostic criteria for periodontitis case definition used in the selected studies were applied to estimate the prevalence of periodontitis in our sample.

Statistical analysis

Data descriptive analysis was performed to determine the frequency estimates of periodontitis (absolute and relative frequencies) for each selected definition.

A chi-square test was performed to compare the frequency of periodontitis among the different diagnostic criteria of periodontitis, considering a statistically significant probability of less than 5% ($p < 0.05$).

RESULTS

A search of the MEDLINE database resulted in a total of 20 published studies. In the initial analysis through the titles and abstracts, eight studies were excluded. Of the twelve studies selected for full text reading, nine studies^{7,11-18} met all inclusion criteria and were considered suitable for data extraction (Figure 1).

Figure 1 – Flow diagram for study collection, showing the number of studies identified, screened, eligible, and included

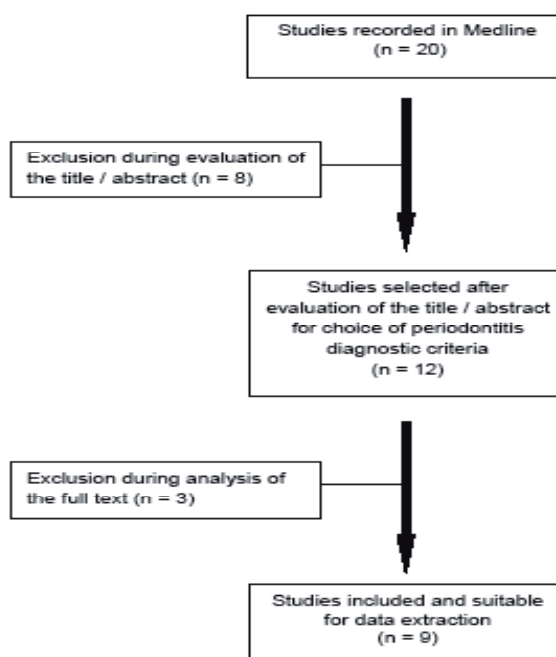


Table 1 shows the diagnostic criteria for the definition of periodontitis in each selected study and the prevalence of periodontitis for each definition. Seven studies,^{7,13-18} performed the clinical periodontal examination of all present teeth, while two studies^{11,12} conducted a partial periodontal examination. Three

studies^{14,16,17} used the criterion of at least one site with PD ≥ 4 or CAL ≥ 4 mm to diagnosis periodontitis. The prevalence of periodontitis in the sample ranged from 24.5% to 72.5%, depending on the diagnostic criteria used. The prevalence of periodontitis in the total sample reported in each study ranged from 4.9% to 66.7%.

Table 1 – Diagnostic criteria for periodontitis definition and frequency of periodontitis

Number	Author / year	Definition of periodontitis	Prevalence of periodontitis reported in the study	Frequency of periodontitis in the present study (n=200)
1	Novak et al. 2006	≥ 1 tooth ≥ 1 site PD ≥ 4mm, CAL ≥ 2mm and BOP Random half-mouth 2 sites per tooth	4.9% (n=199)	63%
2	Xiong et al. 2006	≥ 1 site PD or CAL ≥ 4mm Maximum 14 teeth and 28 sites	14.2% (n=627)	70.5%
3	Dasanayake et al. 2008	1 site PD ≥ 4mm First molars	43.5% (n=87)	64%
4	Xiong et al. 2009 Xie et al. 2013 Xiong et al. 2013	≥ 1 site PD ≥ 4mm or CAL ≥ 4 mm Full-mouth	64.2% (n=102) 66.7% (n=26) 33.3% (n=13)	72.5%
5	Chokwiriyachit et al. 2013	≥ 1 site PD ≥ 5mm and CAL ≥ 2mm Full-mouth	38.0% (n=38)	53.5%
6	Esteves Lima et al. 2013	≥ 4 teeth ≥ 1 site PD ≥ 4mm, CAL ≥ 3mm and BOP Full-mouth	44.7% (n=161)	52.5%
7	Bullon et al. 2014	≥ 2 sites interproximal CAL ≥ 6mm, (not on the same tooth) and ≥ 1 site interproximal PD ≥ 5mm Full-mouth	6.9% (n=13)	24.5%

CAL = clinical attachment level; PD = probing depth; BOP = bleeding on probing.

Table 2 presents data on the comparison of the frequency of periodontitis between the different diagnostic criteria selected for analysis.

Table 2 – Comparing the frequency of periodontitis between different diagnostic criteria

Number of the diagnostic criteria	1	2	3	4	5	6	7
1	-	p = 0.111	p = 0.835	p = 0.042	p = 0.054	p = 0.034	p < 0.001
2	p = 0.111	-	p = 0.166	p = 0.658	p < 0.001	p < 0.001	p < 0.001
3	p = 0.835	p = 0.166	-	p = 0.068	p = 0.033	p = 0.020	p < 0.001
4	p = 0.042	p = 0.658	p = 0.068	-	p < 0.001	p < 0.001	p < 0.001
5	p = 0.054	p < 0.001	p = 0.033	p < 0.001	-	p = 0.841	p < 0.001
6	p = 0.034	p < 0.001	p = 0.020	p < 0.001	p = 0.841	-	p < 0.001
7	p < 0.001	p < 0.001	p < 0.001	p < 0.001	p < 0.001	p < 0.001	-

* Chi-square test.

DISCUSSION

Establishing the diagnosis of periodontitis is extremely complex and directly dependent on the professional’s skills. Different criteria may reflect different prevalence rates and, consequently, different

results. There are several criteria for the diagnosis of periodontitis in the current scientific literature and this diversity may have an impact on the published results. When it comes to association studies, this divergence in the conceptualization of periodontitis

may also have an important impact, contributing to both the positive and negative results, regardless of the studied systemic condition¹⁰. Additionally, it may contribute to make the comparison between studies extremely difficult. Findings from the present study demonstrated that the prevalence of periodontitis in the same sample may vary greatly when different criteria are used for periodontitis case definition.

The clinical periodontal parameters PD and CAL were the most used parameters in the definition of periodontitis in scientific papers¹⁹. When only PD or CAL are isolated and used to reach a periodontitis case definition, a significant bias in the disease estimates may occur; therefore, it is essential that these two parameters be linked to each other in the diagnostic criteria. CAL measurement may reflect an accumulated damage from a past disease and not necessarily reflect current disease activity. PD measurement may change over time due to, for example, cases of hyperplasia or alterations without attachment loss. Moreover, it is important to include in the diagnostic criteria a periodontal parameter that reflects the disease activity, such as BOP²⁰.

Clinical examination is considered the gold standard for the diagnosis of periodontitis. This examination can be performed either with manual probes or with electronic probes. However, factors such as the degree of inflammation, the strength of probe insertion, and the probe inclination may have an impact on the results, underestimating or overestimating the disease²¹. Importantly, none of the included study used the Community Periodontal Treatment Need Index (CPITN)²² for the diagnosis of periodontitis. The CPITN has some limitations and has questionable value in epidemiological studies. It presents a hierarchical concept of the progression of periodontitis. Therefore, one tooth with an altered PD would also be positive for the presence of calculus and for the presence of BOP. Another important limitation is the absence of CAL measurements. Furthermore, the CPITN has no information on the extent and severity of periodontitis²³.

Some studies have analyzed the presence of biological markers and the possibility of using such markers in the diagnosis of periodontitis in the future^{24,25}. However, the clinical examination of periodontal parameters is still considered the standard for the diagnosis. Radiographic examinations, evaluation of tooth mobility, and furcation involvement may present additional information that contributes to the evaluation of periodontal conditions.¹⁹

Another important methodological issue is related to the use of partial periodontal examination as compared to a full-mouth examination. Partial examination is a more rapid evaluation that can be useful in larger epidemiologic studies. However, the

ability of few sites or few teeth to reflect the current periodontal condition of the patient is questionable¹⁰. The prevalence of periodontitis may be underestimated by the partial exam. Thus, results of the studies based on partial periodontal examination should be viewed with caution.

The divergence between the prevalence of periodontitis presented by each study and the prevalence in the present study's sample, using the same diagnostic criteria, shows that individual characteristics of the samples may also have an impact on prevalence estimates. Although periodontitis has a primary bacterial etiology, multiple factors may contribute to the development of the disease. In addition to the individual characteristics, sample size may also have an effect on prevalence rates.

Establishing a universal diagnostic criteria for periodontitis case definition to be used in scientific research can be extremely difficult. It is important that the criteria not underestimate or overestimate the disease and that it properly reflects the periodontal condition, which has systemic repercussions. This fact is essential in association studies between periodontitis and systemic conditions. The standardization of periodontitis case definitions in scientific research is crucial in order to reduce the degree of methodological heterogeneity among the studies and facilitate the comparison of the results.

The results of epidemiological studies are the basis for the planning of public strategies on health, for the implementation of preventive and treatment programs, and for the guidance of clinical practice. Hence, it is important that scientific studies show an elaborate methodology and rigid diagnostic criteria in order to reduce the probability of biased estimates.

CONCLUSION

The prevalence of periodontitis was directly influenced by the periodontitis case definition used in this study. In the sample of pregnant women from the present study, the frequency of periodontitis ranged from 24.5% to 72.5% according to the diagnostic criteria applied. The standardization of the definition of periodontitis in epidemiological studies is crucial for more reliable periodontitis estimates and a better comparison of the studies. The present study reinforces the importance of discussing diagnostic criteria for periodontitis case definitions in clinical and scientific practices.

RESUMO

Objetivo: O objetivo deste estudo foi avaliar o impacto de diferentes critérios de diagnóstico na prevalência de periodontite em mulheres grávidas.

Métodos: A amostra foi composta por 200 mulheres grávidas de um banco de dados. Uma pesquisa na base de dados Medline foi realizada para identificar estudos que avaliaram a associação entre periodontite e diabetes gestacional. Os diferentes critérios de diagnóstico para periodontite utilizados nesses estudos foram aplicados em nossa amostra. A comparação da frequência de periodontite entre os diferentes critérios de diagnóstico foi realizada utilizando o teste qui-quadrado. **Resultados:** Após pesquisa bibliográfica, análise e seleção 9 estudos foram incluídos no presente estudo. Três estudos apresentavam o mesmo critério e, portanto, 7 diferentes critérios para diagnóstico da periodontite foram identificados. A prevalência de periodontite na amostra variou de 24,5% a 72,5% dependendo do critério diagnóstico utilizado. **Conclusão:** Na mesma amostra a prevalência de periodontite pode variar quando diferentes critérios foram utilizados para o diagnóstico. A padronização da definição de periodontite em estudos epidemiológicos é crucial para melhor comparação entre os estudos e melhoria dos resultados.

Unitermos: Diabetes gestacional. Periodontite. Epidemiologia.

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