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## Periodontal Disease as a Risk Factor for Adverse Pregnancy Outcomes-A Systemic Review

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### KEYWORDS

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### ABSTRACT:

The goal of systemic review was to assess the analytical research on periodontal illness as a possible cause for unfavourable pregnancy results. A literature search of the MEDLINE, SciELO, and LILACS bibliographic database servers, as well as the CAPES thesis databases, was done up to December 2005, focussing on epidemiologic investigations involving periodontal disorders and unfavourable pregnancies. Out of the 964 publications discovered, 36 analytical studies met the inclusion requirements. 26 epidemiological analyses found links amongst periodontal conditions and unfavourable birth outcomes. The results showed significant variation among investigations measuring periodontal disease and selecting the category of unfavourable birth outcomes.

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### Introduction

Hunter proposed the potential that pathogenic microbes and their products from infectious foci (including those in the mouth) could migrate into other areas of the body and cause several illnesses in his "focal infection model" in 1910.<sup>1</sup> The notion was criticised for its lack of good scientific proof and was eventually rejected. The exact same notion has recently been presented, positing a link amongst periodontal conditions and unsuccessful pregnancies.

Enhancements in the field of epidemiology statistical analysis, and genetics over the course of the past thirty years, as well as a desire across dental care academics to evaluate impact of dental hygiene on overall health, have resulted in the recovery of the "focal infection theory," via significant improvements in research methodology serving as the primary drivers of this "rebirth." Scientific advancements comprise an easier and more rational study of physiological plausibility, inferring causality, accurate assessment of statistical studies, and the regulation for bias, confounding, and interactional variables.



Research relating gum disease to poor pregnancy outcomes began in 1996, when Offenbacher et al. <sup>2</sup> claimed to discover an important link. Their results piqued interest, particularly the high odds ratio of 7.9 for pregnant women with periodontal conditions and preterm and low birth weight infants. Since then, various studies and reviews have been undertaken on the association between periodontal disease and unfavourable pregnancy results, each with a unique experimental layout, some with major flaws. As an instance, confounding factors have not been thoroughly examined. There is little consensus on potential link between periodontal disease and unfavourable outcomes for pregnancy. The present investigation seeks to offer a comprehensive assessment of statistical investigations on gum disease as a prospective indicator for poor pregnancies.

## Methods

The methods applied in this systematic review cover the literature search strategy and inclusion criteria.

### Literature search strategy

We searched the PubMed, SciELO, and LILACS bibliographic databases and the CAPES thesis/ dissertation database. Standardized methodological filters were used to identify analytical studies and reviews included the following keywords: ((low birth weight OR pre term OR preterm OR prematur\* OR immatur\*) OR (labor OR pregnancy OR birth OR neonatal OR fetal OR intrauterin\*) AND (complication\*

OR disease\* OR adverse)) OR PLBW) AND (periodont\*). We also searched reference lists of identified articles and abstracts. The search was limited to studies on human beings written in English or Portuguese. Studies published before December 21, 2005, were included after identification.

### Inclusion criteria

Articles were selected for inclusion if they addressed various clinical, microbiological, or immunological elements as well as assessments of destructive periodontal disease and unfavourable pregnancy outcomes. Analytical studies were to contain an assessment of the effect of periodontal disease on pregnancy outcomes, as well as statistical tests to compare groups. There had been substantial discrepancy within investigations measuring periodontal disease and the particular kind of unfavourable result of pregnancy utilised as the dependent variable, hence no meta-analysis was conducted.

### Exclusion criteria

Cross-sectional studies reporting periodontal conditions in postpartum women, case reports, ecological studies, experimental animal studies, and previous reviews on this subject were excluded.

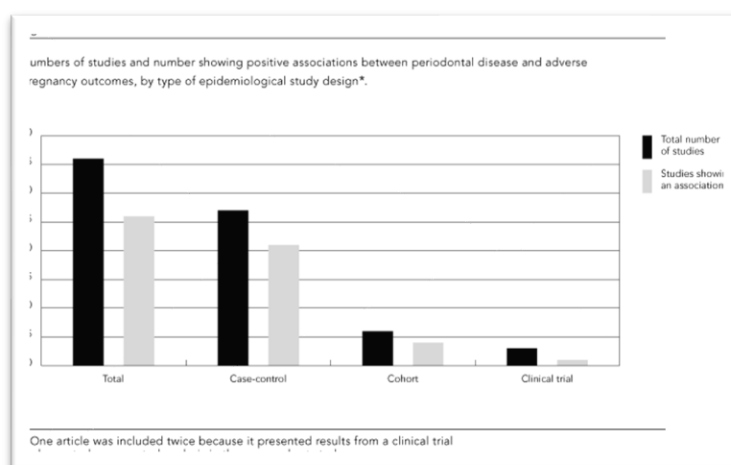
## Results

Out of the 964 papers discovered, 36 analytical studies met the inclusion requirements. One of 36 papers<sup>3</sup> was removed from this analytical analysis since



it was a duplicate of Dasanayake et al's research.<sup>4</sup> One cohort data set was analysed twice in the current review for the reason the research project contrasting additionally the probability of preterm deliveries in receiving and neglected women with

periodontal illness (clinical trial design) and the percentage of periodontal disease between women with preterm and non-preterm birth (nested case-control in a cohort research analysis).<sup>5</sup>



### Low birth weight babies

Low birth weight was investigations.<sup>4, 6, 7, 8, 9, 10, 11, 12, 13</sup> Two studies using the Community Periodontal Index for Treatment Needs (CPITN) to measure periodontal disease yielded contradictory results<sup>8,10</sup>. Comparable discrepancies were found in the outcomes of two studies that used serum IgG concentrations to identify periodontal pathogenic species<sup>4,10</sup> and two studies that used clinical attachment levels to characterise periodontal conditions.<sup>10,13</sup> whereas the limited sample size could account for the lack of ability for identifying the relationship in this research by Louro<sup>8</sup>, this may not be the case in the other investigations that found no correlation among gum recession and reduced birth weight. the result of eight case-control.<sup>9,10,11,12</sup>

### Preterm birth

Nine research had preterm birth as the target result.<sup>9,10,11,12,14,15,16,17,18</sup> The presence of Red and Orange microbial complex organisms in periodontal pockets has been linked to preterm birth.<sup>14,15</sup> Nevertheless, no evidence was discovered supporting the extensive spread of periodontal infections and the associated substances across the body, as indicated by an absence of distinction among maternal blood IgG levels against umbilical cord IgG for maternal periodontal pathogens.<sup>14</sup>

### Preterm low birth weight babies

Preterm low birth weight is the term used to combine the two previous criteria. However, the criteria for preterm low birth weight were not the same in all the studies reviewed.



## Preterm and low birth weight babies

Eight case control investigations looked at preterm premature deliveries while infant was also preterm and had a low birth weight. Davenport et al.<sup>20</sup> found no change in CPITN between patients and controls. Similarly, Offenbacher et al.<sup>19</sup>, Noack et al. (24) and Budunelli et al. (25) discovered similar periodontal disease levels in patients and non-cases. Noack et al. 24 found no difference in periodontal infections across categories. However, crevicular levels of interleukins and periodontopathogens were higher in women with preterm and low birth weight babies.<sup>19</sup> Four other case-control studies reported an increased risk in the periodontal disease group, although using different definitions for periodontal disease<sup>2,21,22,23</sup>. Carta et al.<sup>23</sup> also found differences for prostaglandin E-2 (PGE-2) and interleukin-1 b (IL-1 b) crevicular levels between groups with and without preterm and low birth weight.<sup>2, 19, 20, 21, 22, 23, 24, 25</sup>

## Preterm or low birth weight babies

In five trials, the result was characterised as preterm or low birth weight.<sup>5, 11, 26, 27, 28</sup> Mokeen et al.<sup>27</sup> and Dörtbudak et al.<sup>28</sup> identified varying levels of periodontal disease between patients and controls, although other authors found no variations in periodontal health between groups.<sup>5,11,26</sup> A different investigation found that postpartum women with clinical periodontitis were more likely to have a low birth weight, a preterm birth, premature membrane damage, or impending preterm labour.<sup>29</sup>

## Cohort studies

Six cohort studies were identified<sup>30,31,32,33,34,35</sup>. Preterm birth was the outcome in three trials. Jeffcoat et al.<sup>31</sup> discovered a significant dose-response connection between periodontal attachment loss and gestational age at birth. The researchers employed odds ratio rather than relative risk as an indicators of connection, which may have distorted the relationship because preterm birth is not an unusual event. Holbrook et al.<sup>33</sup> and Marin et al.<sup>34</sup> showed no link between periodontal disease and preterm birth.

## Clinical trials

Three clinical trials were done to assess the efficacy of periodontal therapy in minimising poor pregnancy outcomes.<sup>5,36,37</sup> Only one study shown that periodontal treatments in pregnant women reduced the risk of preterm birth, low birth weight, or both.<sup>36</sup> The probability of preterm birth was not reduced in women who underwent scaling and root planing or those who had received scaling and root planing plus metronidazole.<sup>5,37</sup>

Just one of the three clinical trials used intention-to-treat analysis<sup>36</sup>, which resulted in greater odds ratios than the protocol assessment. Two investigations detailed the unplanned placement of individuals undergoing periodontal therapy.<sup>36,37</sup>

Three cohort studies and one clinical trial did not present information on loss to follow-up<sup>31,32,33,36</sup>. They account for more than 50% of prospective studies conducted to date. If the proportion of women lost in



such studies were large, their validity would be affected.

## Outcome measures

Fourteen of the 36 papers described a method for estimating gestational age. The most commonly used approach was ultrasound foetal measuring. In three investigations, the last menstrual period was employed in conjunction with ultrasound,<sup>30,36,37</sup> while clinical procedures were used in three studies.<sup>2,21,30</sup> Only five research utilised more than one method to estimate gestational age, which is a crucial procedure for minimising classification bias.<sup>2,30,32,36,37</sup>

Difficulties with recalling the last menstrual cycle, irregular menstruation, oral contraceptive use, and first-trimester haemorrhage all have an impact on gestational age estimation accuracy<sup>38</sup>. When comparing to the previous menstrual month, clinicians neonatal screening showed a larger mean overestimation of preterm newborns.

## Periodontal disease measurements

Thirteen different definitions of periodontal disease were used in the 36 selected studies. Furthermore, periodontal disease was assessed by two indices, the CPITN and the Periodontal Disease Index (PDI). CPITN was used in 5 case-control studies<sup>6,7,20,23,27</sup>, although it is considered unsuitable for measuring periodontal severity and prevalence in clinical studies. Periodontitis and gingivitis are related but different, and CPITN mixes both and may thus be a source of exposure misclassification. PDI,

used by Konopka et al.<sup>22</sup>, has similar limitations. The misclassification produced by CPITN and PDI is important, because individuals considered unexposed to periodontal disease can be incorrectly classified as exposed, due to overestimation of periodontal disease, thereby introducing a bias into the analysis.

Because measurement of periodontal disease is so important, it is surprising that only 3 studies provided information on diagnostic reliability in its assessment<sup>11,12,24</sup>. Few studies reported the exact percentage of agreement in clinical calibration for periodontal examination<sup>6,26,31,36</sup>. However, that method is not an adequate statistical test for analyzing measurement reproducibility.

## Confounding

The discrepancy in controlling for confounders was the most striking aspect reported in all research investigating the relationship among gum disease and unfavourable pregnancy results. Psychosocial stress, physical activity, prenatal obesity, domestic violence, and social support are all significant risk variables for poor pregnancy outcomes. However, only one analysis<sup>24</sup> examined stress, and no other relevant risk factors were considered in any investigation on periodontal disease and bad outcomes during pregnancy. This is a significant weakness that casts suspicion on the recommendations of all similar investigations.



## Statistical issues

Although solely bivariate tests were carried out, the positive relationships reported among periodontal illness and unfavourable pregnancy results in five investigations could have been confounded by the effect of potential negative pregnancy outcomes components.<sup>15,19,23,28,34</sup> The final method is inadequate for making statistical inferences due to the lack of control over different variables. In every other research, statistical evaluations were conducted using a multivariate approach, making it possible for the evaluation of each possible factor's independent contribution to the development of poor results.

## Discussion and conclusions

Evidence-driven neonatal therapy has backed methods aimed at reducing neonatal and infant mortality as a result of preterm birth or premature delivery. Scientists in periodontal medicine have contributed information on this subject. Studies relating to periodontal diseases and unfavourable outcomes during pregnancy can assist illuminate additional potential causes for pregnancy complications.

While the majority of the studies examined revealed a positive link among periodontal disease and a greater chance of unfavourable pregnancy outcomes, methodological constraints cast considerable question on the validity of the results and findings.

There were significant variation in methodological quality, with nearly every investigation exhibiting serious flaws such

as small numbers of participants, a restricted number of statistical calculations, insufficient control for potential confounders, insufficient evaluation for the age of delivery and periodontal disorders, and dependencies on data from cross-sectional. The present systematic review did not include a meta-analysis due to the methodological heterogeneity described above. Meta-analysis is regarded as an effective technique for obtaining an in-depth evaluation of connection when doing systematic studies. A recent systematic review discovered a substantial link between periodontal disease and preterm or low birth weight.<sup>40</sup> Fortunately those results were likely biased because they included just 5 research contrasted to the 36 papers examined in the current analysis, implying an oversight in the study's approach and inclusion requirements.

Further research ought to use more than one approach to estimate the age of delivery. The overall validity of methods to estimate gestational age in prenatal care programs appears to be excellent because the great majority of babies are born at or near maturity. Nevertheless, this is confusing in epidemiological research considering the considerable frequency of chosen preterm births and gestational age determination in preterm infants can frequently be inaccurate.

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