Prevalence of periodontal diseases: Latin America and the Caribbean Consensus 2024

Abstract

This review aimed to update knowledge about the prevalence of periodontitis in Latin America and the Caribbean. A critical review of all selected cross-sectional or cohort studies of the region was carried out. Thirty-five studies conducted in 12 countries were selected. The countries with nationally representative studies were Brazil, Chile, Colombia, and Uruguay. The prevalence of periodontal disease or the need for periodontal treatment varied between the different studies and countries depending on the age group, the methodology used, and the case definition. In general, severe

10   periodontitis prevalence ranged between 5.8% and 49.7% in adults. In adolescents, the prevalence of moderate to severe periodontitis was 15.3%. Furthermore, a high prevalence of gingival bleeding in adolescents was reported. When analyzing the studies that used the CPI index and the CDC/AAP case definition, it was observed that as the age of the analyzed individuals increased, the prevalence of periodontal disease also increased. On the other hand, this review revealed that although the number of studies that analyze the prevalence of periodontitis with regional and national representativeness has risen in recent years, their methodological heterogeneity prevents global conclusions for the region. In this way, the need to generate alliances between countries is ratified to join individual efforts to achieve collective goals that translate, among others, into carrying out multicenter studies. These studies would allow the description and monitoring of the epidemiological

20   behavior of periodontitis in Latin America and the Caribbean.

(237/250)

Introduction

Periodontitis is considered a public health problem given its high prevalence, its significant socioeconomic impact, and because it compromises the quality of life and systemic health of individuals.[1–3] Indeed, the high prevalence of severe periodontitis contributes to the global burden of chronic non-communicable diseases.[4]

30   Despite being a largely studied condition in high-income countries, epidemiological studies analyzing the prevalence of periodontitis are sparse in low- and middle-income countries.[5] This mainly occurs in Latin American and Caribbean countries, where data on the prevalence of periodontitis is rare, and methodologies and case definitions have not been standardized.[6–8] Even so, in Latin America, these scarce studies have reported a high periodontitis prevalence in urban and isolated regions, which is strongly determined by individuals' education level, socioeconomic status, and income.[6,7,9] For instance, a systematic review carried out in 2023 assessed the prevalence of periodontitis in dentate people between 2010 and 2021, including 15 studies run in Latin American or Caribbean countries. However, these studies assessed specific populations with no national representation.[5] In 2015, two critical reviews reported that periodontitis prevalence studies with

40   national representation were scarce in Latin America.[6,7] Furthermore, these studies were carried out with substantial methodological heterogeneity, compromising the comparison between countries and regions. Despite that, they reveal that periodontal attachment loss is more prevalent in Latin America than in the United States and Europe.[6,7]

Therefore, it is necessary to carry out an updated review of the available evidence, including evidence recently published, to have a complete overview of the prevalence of periodontitis in Latin America and thus have helpful information for appropriate decision-making in periodontal health. This study summarizes and discusses the scientific articles published until 2023 that report on the prevalence of periodontitis in adolescents and adults in Latin American and Caribbean countries.

Methodology

50   *Information sources and search strategy*

One author (PC) performed the electronic search in PubMed and LILACS (Latin-American Scientific Literature in Health Sciences) databases. The following algorithm built with MeSH terms was used for the PubMed search: "(periodontitis OR gingivitis [MeSH] OR 'chronic periodontitis' OR (periodontal diseases [MeSH]) OR 'attachment loss' OR pocket) AND (prevalence [MeSH] OR epidemiology [MeSH]) AND ('South America' OR Caribbean OR "Latin America")". For LILACS, the following

algorithm was used: "ab:((periodontitis OR gingivitis OR 'periodontitis crónica' OR 'enfermedad periodontal' OR 'pérdida inserción periodontal' OR 'bolsa periodontal') AND (prevalencia OR epidemiología)) AND (db:("LILACS"))". Furthermore, the same author performed a manual search specifying the name of each Latin American and Caribbean country in the journals from which the initial studies were selected.

Type of studies and inclusion criteria

The eligibility criteria were cross-sectional or cohort epidemiological studies that reported the prevalence of periodontal diseases, as clinical attachment loss (CAL), gingivitis, or periodontitis, in adolescents and/or adults until December 2023, without publication date limit, no language restriction, with random sampling, and representative of at least one locality, city, region, or country in Latin America or the Caribbean. In addition, secondary data analysis studies were included when they provided a different result from the original research.

Exclusion criteria

Since the interest of the present study is to identify the general population prevalence, studies that reported it in specific populations (including indigenous people, pregnant women, a population with a particular disease or condition, beneficiaries of a health center, or attendees of a specific university clinic) were excluded. Additionally, literature reviews, studies on self-report of periodontal diseases, and studies where the case definition used was not specified or was only based on the gingival index were excluded.

Data selection, extraction, and presentation

Preliminarily, relevant articles were selected using a title and abstract screening, excluding those that were not relevant according to the inclusion and exclusion criteria detailed above. All eligible studies were read in full text, and the reasons for exclusion were presented in detail. The final agreement to exclude articles was made collectively during the consensus meetings of the research team.

The selected studies were organized through Tables by age group (adolescents and adults), describing the study characteristics and their main results. Information included: first author's name, publication year, city and country were the analyses were performed, inclusion or exclusion criteria, design, sample size, periodontal examination protocol, age range of participants, periodontal criteria used (periodontal case definition), global prevalence, and prevalence by sex.

In order to standardize and systematize the present study findings, the most used periodontal indicator, CPI (Community Periodontal Index) proposed by the WHO for population epidemiological

studies[10], was used as a reference to ensure between countries comparisons. This was accomplished by categorizing the results into CPI>2 and CPI=4; a person having a CPI>2 when presenting a probing depth (PD)>3 mm in at least one sextant and a person having a CPI=4 when presenting a PD >5.5 mm in at least one sextant. In addition, results from studies using the Centers for Diseases Control [CDC]/AAP case definition were independently presented.[11,12] Mild periodontitis was defined as ≥2 interproximal sites with CAL ≥3 mm and ≥2 interproximal sites with PD ≥4 mm (not on the same tooth) or one site with PD ≥5 mm. Moderate periodontitis was defined as ≥2 interproximal sites with CAL ≥4 mm (not on the same tooth) or ≥2 interproximal sites with PD ≥5 mm (also not on the same tooth). Severe periodontitis was defined as ≥2 interproximal sites with CAL ≥6 mm (not on the same tooth) and ≥1 interproximal site with PPD ≥5 mm.

Results

Study selection

The initial electronic search strategy yielded 457 articles, 322 from PubMed, 105 from LILACS, and 30 from manual search (**Figure 1**). These articles were written in English, Spanish, or Portuguese. After removing duplicates, an additional article was discarded because its abstract was inaccessible. Then, 447 articles were identified for the title and abstract screening, and 366 were removed because they did not comply with the inclusion criteria. The full-text assessment resulted in the inclusion of 81 articles. From them, 46 articles were excluded; the reasons for exclusion are summarized in **Figure 1** and **Supplementary Table 1**. Ultimately, 35 articles were included in the present study, of which 17 reported periodontitis prevalence results in adults,[13–29] 14 in adolescents,[30–43] and 4 in both populations.[44–47]

Study characteristics

These 35 studies analyzed populations from 12 of the 33 countries from Latin America and the Caribbean (36.3%), with Chile and Brazil reporting more than one study (**Figure 2a**). From the 1990s, the number of studies increased, particularly studies reporting secondary analysis of previously published data (**Figure 2b**). Regarding their methodology, diverse periodontal examination protocols and case definitions were used. Most studies (n=22) used the CPI index as a case definition (62.9%), three studies (8.6%) used the case definition proposed by Page and Eke[12] for the surveillance of periodontal diseases, and ten studies (28.5%) used other case definitions, including CAL and gingival inflammation (**Figure 3**). All primary studies described sample size calculation, random selection of participants, examiner training, and funding sources.

Periodontitis prevalence in national representative studies

Nationally representative studies were reported in four countries (**Table 1**): Brazil, Uruguay, Chile, and Colombia.

In Brazil, two studies analyzed data from the Brazilian Oral Health Survey 2010 for ages 35-44 years-old.[23,28] These studies examined six index teeth, and the CPI and CAL case definitions were used. Vettore et al.[23] reported a prevalence of 15.3% for moderate-to-severe periodontitis (CPI >2 and CAL ≥4 mm) and 5.8% for severe periodontitis (CPI >2 and CAL ≥6 mm). For both severities of periodontitis, men showed a higher prevalence. Filgueiras et al.[28] reported that 14.5% of the people analyzed had at least two sites with CAL >3 mm and at least one site with PD >3 mm, not necessarily at the same periodontal site.

In Uruguay, using the same methodology as Vettore et al., Lorenzo et al.[16] analyzed data from the First National Survey of Oral Health 2010-2011. Together, for ages 35-44 and 65-74 years-old, it was reported a prevalence of 21.8% and 9.1% for moderate-to-severe and severe periodontitis, respectively. In particular, men had a higher prevalence of moderate-to-severe periodontitis, and women had a higher prevalence of severe periodontitis.

In Chile, Gamonal et al.[19] analyzed data from the First Chilean National Examination Survey 2007-2008, which was carried out using a full-mouth evaluation on six periodontal sites per tooth. For the ages of 35-44 years-old, 93.4% and 38.6% of individuals had at least one periodontal site with CAL >3 mm or CAL >6 mm, respectively. For 65-74 years old, 97.5 and 69.3% of individuals had at least one periodontal site with CAL >3 mm or CAL >6 mm, respectively. When a secondary analysis of these data was performed, combining both age groups, Morales et al.[47] reported a periodontitis prevalence of 88.3% (1.4% for mild periodontitis, 57.2% for moderate periodontitis, and 29.7 for severe periodontitis) using the Page and Eke[12] case definition. Using the classification proposed by the AAP-EFP[48], a prevalence of 98.9% was reported, and most individuals were classified as stage IV periodontitis (81.3%).

In Colombia, Serrano and Suarez[25] analyzed the Colombian Oral Health Study 2014 data, where people ≥18 years-old received full-mouth evaluation on six periodontal sites per tooth. Using the case definition proposed by Page and Eke[12], the prevalence of periodontitis was 61.5% (7.3% for mild periodontitis, 43.6% for moderate periodontitis, and 10.6% for severe periodontitis). Among men, the prevalence of moderate and severe periodontitis was higher.

Periodontitis prevalence in the adult population

For adults, studies analyzing the periodontitis prevalence were reported in six countries (**Table 1**): Argentina,[18] Brazil,[14,15,20–24,26–28,44,45] Chile,[13,19,29,46,47] Colombia,[25] México,[17] and Uruguay.[16]

Different results were obtained in these studies depending on the age group analyzed and the case definition used. In fact, when periodontitis was defined as having at least one periodontal site with PD >3 mm or CPI >2, periodontitis prevalence varied between 11.6% and 99.9%. On the other hand, when periodontitis was defined as having at least one periodontal site with CAL ≥5mm, Susin et al.[45] reported in young adults from Porto Alegre, Brazil, a periodontitis prevalence of 17.2% in ages 20-24 years-old and 29.0% in 25-29 years-old. For adults aged ≥60 years-old from Porto Alegre, Gaio et al.[21] reported a periodontitis prevalence of 94.1%. In the same country, Corraini et al.[44] reported for adults in Cajaíba a periodontitis prevalence of 37.1% in the 20-29 years-old group, which increased to 70.0%, 83.3%, and 100% in the age groups 30-39, 40-49, and ≥50 years-old, respectively. With the same case definition, Gamonal et al.[19] reported a periodontitis prevalence of 58.3% and 81.4% in Chilean age groups 35-44 and 65-74 years-old, respectively. In these studies, the periodontitis prevalence was lower when a stricter case definition was used, for instance, more than one tooth with CAL or the combination of PD and CAL. Indeed, periodontitis prevalence varied between 14.5% and 72.0% for moderate-to-severe periodontitis[16,17,23,25,28,45] and between 5.8% and 49.7% for severe periodontitis.[14,16,23] In general, all these studies reported a higher prevalence of periodontitis in men.

Gingivitis and periodontitis prevalence in the adolescent population

To report the prevalence of gingivitis and periodontitis in adolescents, studies were carried out in seven countries (**Table 2**): Antigua and Barbuda,[31] Brazil,[35,37,38,40,42,44,45] Chile,[32,33,36,46] Dominica,[30] Ecuador,[43] Dominican Republic,[34] and Puerto Rico.[41] In addition, a multicenter study was carried out in which adolescents from Argentina, Chile, Colombia, Ecuador, and Uruguay were analyzed.[39]

In the case of periodontitis, when the case definition involved the CPI, a prevalence not exceeding 16.3% was observed (adolescents with at least one periodontal site with PD >3 mm or CPI >2). In the multicenter study, a prevalence of 59.3% was reported. On the other hand, when CAL was involved in the case definition, prevalences not exceeding 22.3% (adolescents with at least one periodontal site with CAL ≥3 mm) and 7.7% (adolescents with at least a periodontal site with CAL ≥5 mm) were observed. In the multicenter study, a prevalence of 32.6% for cases with CAL ≥3 mm was reported. Conversely, a lower prevalence was observed when a stricter case definition was used. Indeed, Susin et al.[45] reported a prevalence of 18.2% (adolescents with more than one tooth with

180   CAL ≥3 mm), and Morales et al.[47] reported a prevalence of 15.3% (adolescents with detectable interdental CAL in at least two non-adjacent teeth), with 8.1% of individuals classified as stage III or IV periodontitis (adolescents with at least two non-adjacent teeth with interdental CAL ≥5 mm).

In the case of gingivitis, a high prevalence was reported when the gingivitis case was established as the detection of gingival bleeding and at least one local factor (such as dental calculus) in at least one periodontal site (CPI=1 or CPI=2). In particular, the gingivitis prevalences were 28% in Antigua y Barbuda, 62% in Dominica, 80.4% in Puerto Rico, and 92% in Ecuador [30,31,41,43]. In Chile, the prevalence of gingivitis varied between 8.7% and 42.2% in the different cities studied.[32,36,46] In Brazil, the gingivitis prevalence varied between 21.6% and 96.2% in the cities studied;[35,37,38,40] with a national study carried out on adolescents of 12 years old and between 15-19 years old reporting a

190   prevalence of 33.1%.[42]

Results reanalysis using CPI as the case definition

To perform a global analysis of the herein summarized findings, the data from 18 studies (51%) from 4 countries and the multicenter study in adolescents were re-categorized as CPI >2 and CPI=4. Then, periodontal disease prevalences were ordered according to age (**Figure 4**). Two studies did not provide data to establish the category CPI >2,[27,29] and two other studies for CPI =4.[26,39] The data reanalysis revealed that for adolescents, the prevalence of periodontal disease with CPI>2 ranged between 2% to 29%, and with CPI=4 did not exceed 3%. However, prevalence increased considerably with age, reaching 99.9% in the most affected population (65-74 years-old, in Chile), with 71.4% of individuals being classified as CPI =4.

200   ### Global analysis of the studies that used the Page y Eke recommended case definition

Figure 5 shows the prevalence of periodontitis in the four studies that used the case definition recommended by Page and Eke[12]. In the multicenter study in adolescents, a periodontitis prevalence of 27.2% was reported, with 0.5% having severe periodontitis.[47] At the age of 31 years, in Pelotas, Brazil, a prevalence of moderate-to-severe periodontitis of 37.3% and a prevalence of severe periodontitis of 14.3% was reported.[24] Then, in the age range of 18 to 79 years-old in the national study carried out in Colombia, the periodontitis prevalence was 61.5%, with 10.6% having severe periodontitis.[25] Finally, for ages between 35-44 and 65-74 years-old in the national study carried out in Chile, the prevalence of periodontitis was 88.3%, with 29.7% being severe periodontitis.[47] In sum, these results confirm that along with increasing age, the prevalence of periodontitis also increases.

210   ## Discussion

In the present study, an updated review of the epidemiological studies that have analyzed the prevalence of periodontal disease in adolescents and adults from Latin America and the Caribbean was carried out. According to our findings, the situation described by Botero and Oppermann in 2015[6,7] is maintained at the end of 2023. Although the number of studies with regional or national representativeness has increased, the methods used and the case definition are heterogeneous. Furthermore, the available evidence is insufficient to describe the region globally. Indeed, most countries have no nationally representative epidemiological studies; when they exist, they are mostly around 30 years old. Even so, we can conclude that periodontal disease significantly affects the vast majority of the populations analyzed, and its prevalence increases significantly with age, showing a prevalence ranging between 15.3% to 59.3% in adolescents and 11.6% to 99.9% in adults.

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Studies with national representation of the adult population have been carried out in Brazil, Colombia, Chile, and Uruguay. In the studies from Brazil and Uruguay, a prevalence of 5.8% and 9.1% severe periodontitis was reported in 35-44 year adults, when the case definition used involved the CPI index and the CAL with partial mouth recording. Similarly, in the study from Colombia, a prevalence of severe periodontitis of 10.6% was reported at the age of 18-79 years, using the case definition proposed by Page and Eke with full-mouth registration. However, in Chile, a higher prevalence of severe periodontitis was reported, reaching 29.7% at the combined age of 35-44 and 65-74 years, also using the Page and Eke proposal of case definition with full-mouth registration. Thus, it is evident that the different reported prevalences of severe periodontitis among these countries are due, at least in part, to the different ages of the individuals analyzed and the various methods of periodontal evaluation. Indeed, as previously established, partial records may underestimate the prevalence of periodontitis.[49] Furthermore, it is also evident that the variability of results is due to the heterogeneous definition of the periodontal case.

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A criterion widely used to define severe periodontitis is PD >6 mm, given its relevance in public health and because it contributes to determining the need for periodontal treatment. Recently, this case definition was used in the Global Burden of Disease study conducted by Wu et al.[4], and a prevalence of severe periodontitis in adults of around 19% was reported for the America continent. In the present review, when the articles using the case definition of PD >6 mm or a CPI=4 were analyzed, a prevalence between 14% and 71% was observed, depending on the age of the analyzed Latin American adults. This greater prevalence of severe periodontitis in Latin America could be related to a greater frequency of social determinants that contribute to the burden of chronic non-communicable diseases, such as periodontitis, and include low socioeconomic and education levels and high prevalence of risk factors. Particularly in Chile, the prevalence of smoking and type II

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diabetes mellitus is higher than that of other Latin American countries, and it could contribute to its higher prevalence of severe periodontitis.[50–53]

Concerning the new classification of periodontal and peri-implant diseases and conditions proposed by the AAP/EFP, it should be cautiously considered when used in studies to describe the prevalence of periodontitis. In the study by Morales et al., a reanalysis of two primary studies was carried out, reclassifying the individuals considering the case definition proposed by Page and Eke[12] and the new AAP/EFP classification.[48] In the first case, the prevalence of severe periodontitis was 0.5% in adolescents and 29.7% in adults. Conversely, in the second case, the prevalence was much higher, reporting that 8.1% of adolescents and 94.1% of adults had stage III and IV periodontitis. Thus, as established elsewhere, the new classification proposed by the AAP/EFP is not recommended for use in epidemiological studies, given that it tends to overestimate the prevalence of periodontitis and, consequently, the need for periodontal treatment.[54,55]

When the studies carried out in different countries in Latin America and the Caribbean were globally analyzed, a high prevalence of gingivitis in adolescents was revealed. In this way, a challenge is generated to identify and resolve this disease early and stop its progression to periodontitis. In the same way, although with less evidence, a high prevalence of periodontitis was revealed in adults, which could lead to severe forms of the disease that can compromise the general health and quality of life of individuals. One of the limitations of the present review was that a search of the gray literature was not carried out, nor were databases from universities and ministries of health analyzed. Thus, diverse studies on the prevalence of gingivitis or periodontitis in the region could be helpful for our analysis but were not considered. Even so, one of the strengths of our study is the systematization of all the literature published in the traditional databases through a broad search without language and time restrictions. This allowed an update of the knowledge as of December 2023 and complemented what was reported for the region until 2015.[6,7] Although few articles met the inclusion criteria herein established, they tell us about active Latin American and Caribean countries at the level of university campuses with studies in specific populations with relevant information, which undoubtedly contribute to local health decision-making. Indeed, these studies together show that the prevalence of periodontal disease increases with the age of the population, which is a critical determinant that must be considered when defining public policies on periodontal health. This is particularly relevant when, in recent years, an accelerated aging process has been evident in Latin America and the Caribbean.[8,56] Moreover, emerging evidence establishes that chronological aging and premature periodontal immunosenescence contribute to the pathogenesis of periodontitis.[57,58]

In this context, the efforts of various professional and scientific organizations and societies are notable, which have handled their resources to reveal periodontal health problems worldwide, including the Global Report of the WHO, the FDI World Dental Federation, the International Association for Dental Research (IADR), the ORCA/EFP Consensus, and the LAOHA Consensus[59].

280   Based on the findings herein, we recommend generating alliances and international consensus to monitor gingivitis and periodontitis in the region adequately. In particular, it is essential to agree on the definition of the periodontal case, standardized measure criteria, homogenous evaluation methods, and age groups to analyze as priorities for future epidemiological studies. In the last consensus convened by the LAOHA in 2015,[59] the need to implement actions to promote prevention, early diagnosis, and timely treatment of periodontitis was identified. At this moment, we recommend designing and implementing multicenter studies with national representation in which a unique case definition is assessed, such as the CPI index or that proposed by Page and Eke,[11,12,60] Indeed, in such a way as to generate reliable, reproducible, and comparable data. The goal is to facilitate the organization and systematization of information to foster the generation of public policies, preventive

290   plans, and early diagnosis and treatment strategies that allow us to resolve the serious periodontal reality in Latin America and the Caribbean.

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Tables

Table 1. Description of included studies for periodontal disease in adults.

Authors (year)	Country, City	Inclusion criteria	Exclusion criteria	Type of studied	Sample size (n)	Periodontal examination protocol	Age interval (years)	Periodontal criteria	Prevalence (CI) (%)	Prevalence by sex (%) female/male
Gamonal JA, et al (1998)[13]	Chile, Santiago	Adults, 35 to 44 and 65-74 year-old	NR	Cross sectional, randomly	868 adults and 217 adult seniors	Ten index teeth, CPITN index, WHO probe	35-44 65-74	CPITN=3 CPITN=4 CPITN=3 CPITN=4	50.2 40.6 28.5 71.4	NR
Susin C et al (2004)[14]	Brazil, Porto Alegre	Adults, 30 years and older	Edentolous and participant diagnosed with psychiatric problems or intoxicated with alcohol or drugs	Cross sectional, randomly	853	Six sites per tooth in full-mouth, PCP10-SE periodontal probe	30-103	Cases were defined as individuals with ≥ 30% teeth with CAL ≥ 5mm	49.7	40.5/54.9
Susin C, et al (2005)[15]	Brazil, Porto Alegre	Adults, 30 years and older	Edentolous, individuals diagnosed with serious psychiatric problems, or were intoxicated with alcohol or drugs	Cross sectional, randomly	853	Six sites per tooth in full-mouth, PCP10-SE periodontal probe	30–103	At least one tooth with PD: PD ≥ 4mm PD ≥ 5mm PD ≥ 6mm PD ≥ 7mm	79.6 65.2 35.3 25.4	72.2/87.8 55.6/75.9 27.6/43.8 20.3/31.0

Lorenzo SM, et al (2005)[16]	Uruguay	Adults and elderly	Edentolous	NRS. Cross sectional, First National Survey of Oral Health 2010-2011	adults=358 and elderly 411	Six index teeth, CPI index, WHO probe	35-44 and 65-74	Periodontal disease was defined as: Moderate to severe when CPI > 2 and CAL ≥ 4mm	21.8	12.9/30.1
								Severe when CPI > 2 and CAL ≥ 6	9.1	6.5/1.7
Borges-Yáñez SA, et al (2006)[17]	México, three different populations in Central Mexico	Adults, 60 years and older of urban areas of middle and low income level, and a rural area	Edentolous	Cross sectional, randomly	365	Two sites per tooth in partial-mouth, Michigan periodontal probe	60 and older	At least two sites with CAL 4mm or more	50.7	NR
Romanelli H, et al (2007)[18]	Argentina	Adults, 18 to 84 years of age, who spontaneously attended general dental services, with at least two teeth in any sextant	Patients with risk of endocarditis, diabetes or immunologic disease, and patients receiving corticoids or immunosuppressor drugs	Cross sectional	3,694	Six sites per tooth in full-mouth, CPI index, WHO periodontal controlled pressure probe, Sensor Probe Type C	18-84	CPI=1 CPI=2 CPI=3 CPI=4	17.2 38.8 26.4 14.3	NR

Corraini P, et al (2008)[44]	Brazil, microarea Cajaíba	Adolescents and adults, ≥ 12 year-old	Edentolous	Cross sectional, census	194	Six sites per tooth in full-mouth, PCP-UNC-15, periodontal probe	12-82	At least one site with CAL or PD by age: **20-29** CAL ≥ 5mm, CAL ≥ 7mm PD ≥ 5mm, PD ≥ 7mm **30-39** CAL ≥ 5mm, CAL ≥ 7mm PD ≥ 5mm, PD ≥ 7mm **40-49** CAL ≥ 5mm, CAL ≥ 7mm PD ≥ 5mm, PD ≥ 7mm **≥ 50** CAL ≥ 5mm, CAL ≥ 7mm PD ≥ 5mm, PD ≥ 7mm	 37.1, 8.1 30.1, 4.8 70.0, 20.0 37.5, 10.0 83.3, 66.7 70.8, 29.2 100, 83.3 60.0, 20.0	NR
Gamonal J, et al (2010)[19]	Chile	Adults, urban, aged 35 to 44 year-old and adult seniors aged 65 to 74 year-old	Edentolous	Cross sectional, randomly	1,092 adults and 469 adult seniors	Six sites per tooth in full-mouth, PCP-UNC-15, periodontal probe	35-44 65-74	At least one site with CAL: CAL > 3mm, CAL > 4mm CAL > 5mm, CAL > 6mm At least one site with CAL. CAL > 3mm, CAL > 4mm CAL > 5mm, CAL > 6mm	 93.4, 77.5 58.3, 38.6 97.5, 92.7 81.4, 69.3	 92.3/94.9, 72.6/836 41.6/66.5, 32.3/46.4 97.3/98.0, 90.9/95.4 76.7/88.2, 62.6/79.1
Frias AC, et al (2011)[20]	Brazil, Guarulhos	Adults, 35 to 44 year-old	NR	Cross sectional, randomly	263		35-44	CPI=0 CPI=1 CPI=2 CPI=3 CPI=4	10.6 (7.3–14.8) 9.1 (6.1–13.1) 53.6 (47.6–59.9) 22.4 (17.7–27.8) 4.2 (2.2–7.2)	NR
Susin C, et al (2011)[45]	Brazil, Porto Alegre	Adolescents and young adults, 14 to 29 year-old	Subjects with serious neurologic or psychiatric conditions were excluded and Aggressive periodontitis cases	Secondary study from a larger sample representative of the population of Porto Alegre	584 (174, 20-24 year-old and 154, 25-29 year-old)	Six sites per tooth in full-mouth, PCP10-SE periodontal probe	20-24	At least one site with CAL: CAL ≥ 3mm CAL ≥ 4mm CAL ≥ 5mm CAL ≥ 6mm Chronic periodontitis was defined as CAL ≥3mm	53.4 (43.0–63.8) 35.4 (24.2–46.6) 17.2 (9.5–25.0) 9.5 (3.3–15.8) 43.5 (32.0–55.0)	NR NR

						25-29	affecting two or more teeth. At least one site with CAL: CAL ≥ 3mm CAL ≥ 4mm CAL ≥ 5mm CAL ≥ 6mm Chronic periodontitis was defined as CAL ≥3mm affecting two or more teeth.	79.4 (69.5–89.3) 56.4 (44.1–68.7) 29.0 (24.3–33.6) 13.8 (6.6–20.9) 72.0 (57.4–86.6)	NR NR
Gaio EJ, et al (2012)[21]	Brazil, Porto Alegre	Elderly, 60 years and older	Presence of conditions that may pose health risks, or that may interfere with the clinical examination	Cross sectional, randomly, subsample	217	Six sites per tooth in full-mouth, PCP10-SE periodontal probe	≥ 60	At least one site with CAL or PD: CAL ≥ 4mm, CAL ≥ 5mm CAL ≥ 6mm, CAL ≥ 7mm PD ≥ 4mm, PD ≥ 5mm PD ≥ 6mm, PD ≥ 7mm	100, 94.1 84.4, 73.9 74.5, 62.6 31.8, 22.2	NR
Bonfim M.d.L.C, et al (2013)[22]	Brazil, Southern region	Adults in urban area, 35 to 44 year-old	Edentulism, refusal to participate, being bedridden, inability to answer the questions	Secondary study from a larger sample representative of the population	743	CPI index, WHO probe	35-44	CPI=0 CPI=1 CPI=2 CPI=3 CPI=4	36.5 2.0 47.1 9.5 2.1	NR
Vettore MV, et al (2013)[23]	Brazil	Adults, 35 to 44 year-old	Without complete data	NRS. Secondary study from Brazilian Oral Health Survey 2010	4,594	Six ndex teeth, CPI index and CAL, WHO probe	35-44	Moderate-to-severe (CPI > 2 and CAL ≥ 4mm) Severe periodontal disease (CPI > 2 and CAL ≥ 6mm)	15.3 5.8	13.5/14.9 3.6/5.7

Giacaman RA, et al (2016)[46]	Chile, Maule region	Population from Maule region urban and rural, 15, 35 to 44 and 65 to 74 year-old	NR	Cross sectional, randomly	2,414	Six index teeth, CPI index, WHO probe	35-44 and 65-74	CPI=1, CPI=2 CPI=3, CPI=4 CPI=1, CPI=2 CPI=3, CPI=4	2.9, 77.2 17.2, 2.5 1.5, 65.8 25.0, 3.8	2.9/3.1, 77.3/76.6 16.9/18.8, 2.6/1.6 2.1/0.0, 68.7/56.9 23.6/29.2, 3.1/6.2
Schuch HS, et al (2018)[24]	Brazil, Pelotas	Adults, 31 year-old	NR	Secondary study from the 1982 Pelotas Birth Cohort Study	539	Six sites per tooth in full-mouth, PCP2 periodontal probe with 2-mm banding	31	CDC-AAP (2012) case definition periodontitis Any periodontitis Moderate-to-severe	37.3 14.3	31.6/42.9 10.1/18.3
Serrano C, Suarez E (2019)[25]	Colombia	Adults, 18 years and older	Presence of uncontrolled diseases, severe physical or mental disability, and health conditions that would require antibiotic. Edentolous, >79 year-old	NRS. Cross sectional, randomly	9,255	Six sites per tooth in full-mouth, PCP-UNC-15, periodontal probe	18-79	CDC-AAP (2012) case definition periodontitis Mild Moderate Severe	7.3 43.6 10.6	7.8/6.2 42.0/45.3 7.5/13.9
Arantes R et al. (2021)[26]	Brazil, Central-West	Adults, 35 to 44 year-old non-Indigenous	NR	NRS. Secondary study from Brazilian Oral Health Survey 2010	1,830	Six ndex teeth, CPI index and CAL, WHO probe	35-44	CPI=2 CPI=3 + CPI=4	43.9 (37.4-50.7) 30.5 (28.2-32.9)	NR
Hugo FN, et al (2022)[27]	Brazil	NR	NR	Secondary study from Global Burden Disease 2019	NR	NR	NR	CPITN=4 or CAL > 6mm or PD > 5mm	11.9 (8.6-15.4)	NR

Morales A, et al (2022)[47]	Chile	Adults, urban, aged 35 to 44 and 65-74 year-old	Edentolous	NRS. Secondary study from First Chilean National Examination Survey 2007-2008	1,456 adults	Six sites per tooth in full-mouth, PCP-UNC-15, periodontal probe	35-44 and 65-74	CDC-AAP (2012) case definition Mild Moderate Severe AAP/EPP (2018) stage of periodontitis Stage I Stage II Stage III Stage IV	 1.4 57.2 29.7 0.1 4.7 12.8 81.3	NR
Filgueiras LV, et al (2023)[28]	Brazil	Adults users of public services, 35 to 44 year-old	Edentolous and insufficient dental sextants for CAL examination	NRS. Secondary study from Brazilian Oral Health Survey 2010	3,426	Six ndex teeth, CPI index and CAL, WHO probe	35-44	At least two sites with CAL > 3mm, and at least one site with PD > 3mm, not necessarily at the same site	14.5	NR
León S, et al (2023)[29]	Chile	Elderly, 65 years and older	NR	Secondary study from Global Burden Disease 2019	NR	NR	65-69 70-74 75-79 80-84 85-89 90-94 >94	CPI=4 (probing score > 5.5 mm)	29.1 (22.0-37-5) 26.8 (20.2-34.9) 25.4 (19.2-32.1) 24.4 (18.1-30.7) 23.8 (16.9-30.3) 23.2 (15.9-30.0) 22.7 (14.7-30.8)	NR

Periodontal criteria: CPITN: Community Periodontal Index Treatment Needs; CAL: Clinical Attachment Loss; PD: Probing deep; CPI: Community Periodontal Index
NRS: National representative study
NR: Not reported data

Table 2. Description of included studies for periodontal disease in adolescents.

Authors (year)	Country, City	Inclusion criteria	Exclusion criteria	Type of studied	Sample size (n)	Periodontal examination protocol	Age interval (years)	Periodontal criteria	Prevalence (CI) (%)	Prevalence by sex (%) female/male
Leake JL, et al (1990)[30]	Dominica	Children, 12 year-old, attending scholl	NR	Cross sectional, randomly	332	Six index teeth, CPITN index, WHO probe	12	CPITN=0 CPITN=1 + CPITN=2	17 62	NR
Vignarajah S (1994)[31]	Caribbean Island Antigua y Barbuda	Children and adolescents, attending urban and rural schools, 12, 15-19 year-old	NR	Cross sectional, randomly	246, and 456	Six index teeth, CPITN index, WHO probe	12 15-19	CPITN=0 CPITN=1, CPITN=2 CPITN=0 CPITN=1, CPITN=2 CPITN=3, CPITN=4	26.0 28.0, 43.0 14.0 13.0, 56.0 14.0, 3.0	NR
Lopez NJ, et al (1996)[32]	Chile, Santiago	Adolescents, 15 to 19 year-old attending high school		Cross sectional, randomly	2,400	Six index teeth, CPITN index, WHO probe	15-19	CPITN=0 CPITN=1, CPITN=2 CPITN=3, CPITN=4	5.4 14.8, 62.2 9.5, 0.9	NR
Lopez R, et al (2001)[33]	Chile, Province Santiago	Adolescents, 12 to 21 year-old attending high school	Not be examined due to constraints such a trismus	Cross sectional, randomly	9,162	Six sites of first and second molars and incisors	12-14 15-17 18-21	At least one site with CAL ≥ 3 mm	2.5 3.7 6.8	2.2/2.9 4.7/2.8 5.2/7.9

Collins J, et al (2005)[34]	Dominican Republic, Santo Domingo	Adolescents, 12 to 21 year-old attending high school	No CAL detected	Cross sectional, randomly	1,963	Six sites of first and second molars and incisors	12 - 21	At least one site with CAL ≥ 1mm CAL ≥ 2mm CAL ≥ 3mm	49.5 15.0 4.0	49.3/49.6 15.1/14.9 4.2/3.7
Corraini P, et al (2008)[44]	Brazil, microarea Cajaíba	Adolescents and adults, ≥ 12 year-old	Edentolous	Cross sectional, census	194	Six sites per tooth in full-mouth, PCP-UNC-15, periodontal probe	12-82	At least one site with CAL or PD by age: **12-19** CAL≥5mm, CAL≥7mm PD ≥5mm, PD ≥7mm	7.7, 5.1 5.1, 5.1	NR
Antunes JL et al. (2008)[35]	Brazil, Sao Paulo	Adolescents, 15 to 19 year-old	Asian and Amerindian categories	Cross sectional, randomly	1,799	Six index teeth, CPI index, WHO probe	15-19	CPI=0 CPI=1 CPI=2	65,7 (63.5-67.9) 21.6 (19.7-23.6) 19.4 (17.6-21.3)	NR 19.5/24.5 17.4/22.1
Susin C, et al (2011)[45]	Brazil, Porto Alegre	Adolescents and young adults, 14 to 29 year-old	Subjects with serious neurologic or psychiatric conditions were excluded and Aggressive periodontitis cases	Secondary study from a larger sample representative of the population of Porto Alegre	584 (256 14-19 year-old)	Six sites per tooth in full-mouth, PCP10-SE periodontal probe	14-19	At least one site with CAL: CAL ≥ 3mm CAL ≥ 4mm CAL ≥ 5mm CAL ≥ 6mm Chronic periodontitis was defined as CAL ≥3mm affecting two or more teeth.	22.3 (12.2–32.5) 13.0 (6.5–19.5) 7.4 (2.0–12.8) 2.5 (0.4–4.6) 18.2 (7.9–28.4)	NR NR NR NR NR

Wauters M, et al (2014)[36]	Chile, Castro	Children aged 12 year-old attending urban, public and private-subsidized schools	Students with fixed orthodontics appliances and/or a pathology, such as Down syndrome, trismus and epilepsy	Cross sectional, randomly	242	Six index teeth, CPITN index, WHO probe	12	CPITN=0 CPITN=1 CPITN=2 CPITN=3	0.0 42.2 44.2 13.6	0.0/0.0 45.0/38.9 42.6/46.0 12.4/15.0
Leão MM, et al (2015)[37]	Brazil, Caiuá, São Paulo State	Adolescents, 10 to 19 year-old, rural school	Refused study participation	Cross sectional, census	180	Six index teeth, CPI index, WHO probe	10-19	CPI=1 CPI=2 CPI=3	77.7 20.8 1.5	NR
Fonseca EP, (2015)[38]	Brazil, Vale do Jequitinhonha	Adolescents, 15 to 19 year-old	Individuals with difficulties cognitive or mentalis	Cross sectional, randomly	450	CPI index with some modifications	15-19	CPI=0 CPI=1 CPI=2	3.5 51.5 8.4	3.3/3.8 57.8/44.2 6.6/10.5
Morales A, et al (2015)[39]	Latin America, Capital cities from countries in South America, Argentina, Chile, Colombia, Ecuador and Uruguay	Adolescents, 15 to 19 year-old attending public and private high school	Subjects undergoing fixed orthodontic treatments or with any condition that required antibiotic prior to the periodontal examination	Cross sectional, randomly, multicenter	1,070	Six sites per tooth in full-mouth, PCP-UNC-15, periodontal probe	15-19	At least one site with CAL or PD: CAL ≥ 3mm PD ≥ 4mm BoP ≥ 25%	32.6 59.3 28.6	35.8/29.1 58.9/59.6 34.1/22.7

Tomazoni F et al (2016)[40]	Brazil, Santa Maria	Children aged 12 year-old attending public schools	NR	Cross sectional, randomly	1,134	Six index teeth, CPI index, WHO probe	12	Gingivitis was considered if: At least one superface showed CPI=1	96.2 (95.1–97.3)	NR
								Using a cut-off point of >15% bleeding	26.2 (23.7–28.8)	
Giacaman RA, et al (2016)[46]	Chile, Maule region	Population from Maule region urban and rural, 15, 35 to 44 and 65 to 74 year-old	NR	Cross sectional, randomly	2,414	Six index teeth, CPI index, WHO probe	15	CPI=1, CPI=2 CPI=3, CPI=4	8.7, 74.4 16.3, 0.0	11.0/6.8, 71.1/77.0 17.0/15.8, 0.0/0.0
Elias-Boneta AR, et al (2018)[41]	Puerto Rico	Children, 12 year-old, attending public and private schools, physical status ASA I and ASA II	Participants with conditions requiring antibiotic prophylaxis	Cross sectional, randomly	1,586	Gentle probing into gingival sulcus of the buccal surface, PCP UNC 126 periodontal probe	12	At least one site presented gingival bleeding.	80.4	79.5/81.2
								Gingivitis limited: 2–4 teeth or 25% to 49% of the teeth examined presented gingival bleeding	19.5	18.7/20.4
								Extensive gingivitis: >5 teeth or >50% of the teeth examined presented gingival bleeding	60.8	60.8/60.8
Knack K et al, (2019)[42]	Brazil	Adolescents, 12, 15 to 19 year-old	NR	NRS. Secondary study from Brazilian Oral Health Survey 2010	12,773 (7,328 12-year-old and 5,445 15-19)	Six ndex teeth, CPI index and CAL, WHO probe	12, 15-19	CPI=1 CPI=2 CPI=3 CPI=4	32.0 33.1 4.5 0.3	31.8/32.2 31.6/34.6 NR NR

Michel-Crosato E, et al (2019)[43]	Ecuador, Quito	Children aged 12 year-old attending public and urban schools	NR	Cross sectional, randomly	1,100	Six index teeth, CPIT index, WHO probe	12	CPITN=1	92.0	NR
Morales A, et al (2022)[47]	Capital cities from countries in South America, Argentina, Chile, Colombia, Ecuador and Uruguay	Adolescents from South America, attending schools, 15 to 19 year-old	Edentolous	Secondary study from a sample of adolescents from different countries in South America 2010-2012	1,070	Six sites per tooth in full-mouth, PCP-UNC-15, periodontal probe	15-19	CDC-AAP (2012) case definition Mild Moderate Severe AAP/EPP (2018) stage of periodontitis Stage I Stage II Stage III Stage IV	11.4 15.3 0.5 39.3 28.2 7.6 0.5	NR NR

500 Periodontal criteria: CPITN: Community Periodontal Index Treatment Needs; CAL: Clinical Attachment Loss; PD: Probing deep; CPI: Community Periodontal Index; BoP: Bleeding on Probing
NRS: National representative study
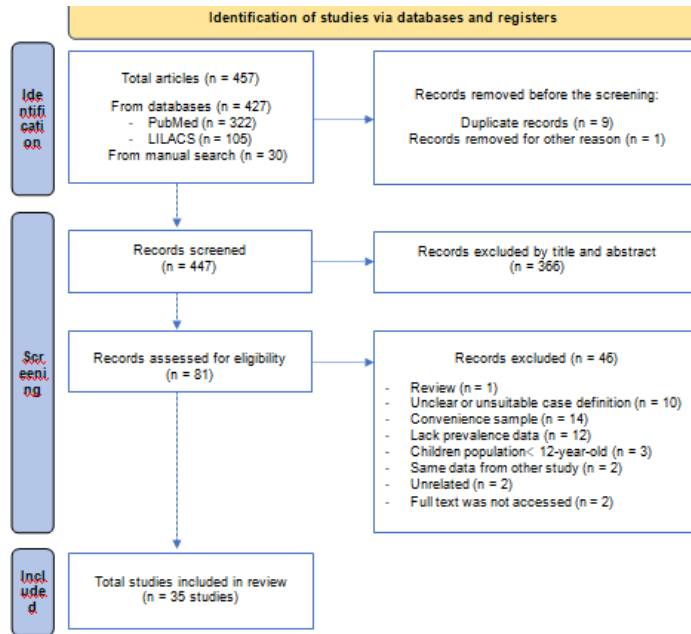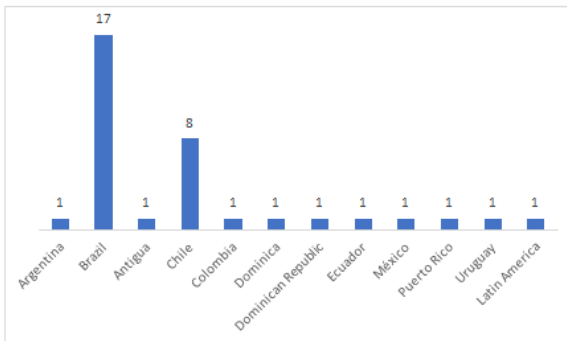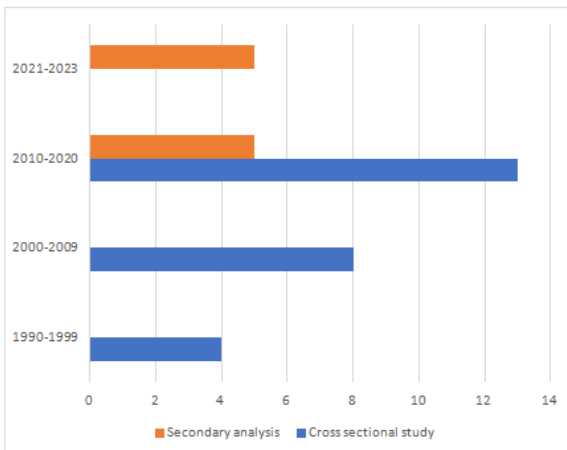NR: Not reported data

Figures

Figure 1. Flow diagram of literature search and selection criteria, based on the PRISMA 2020 statement.[61]

(a) Number of studies by country from Latin America and the Caribbean

(b) Number and type of studies by time period from Latin America and the Caribbean

510   **Figure 2**. Number of studies by country (**a**) and by time period and type of studies (**b**) from Latin America and the Caribbean found in the search strategy included in the review.
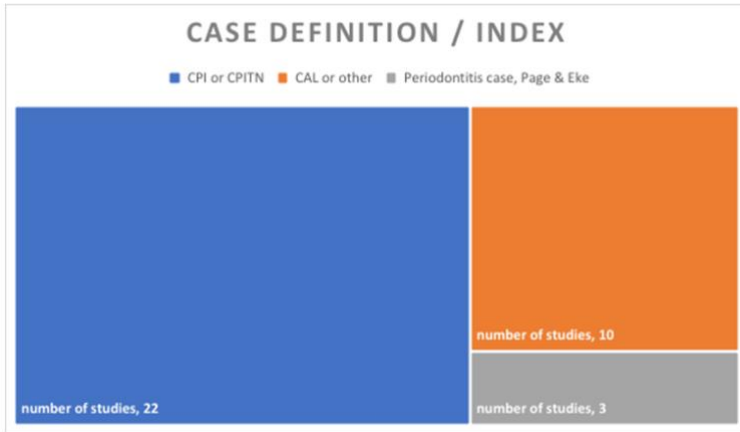
Figure 3. Number of studies according to case definition or index used as periodontal criteria.
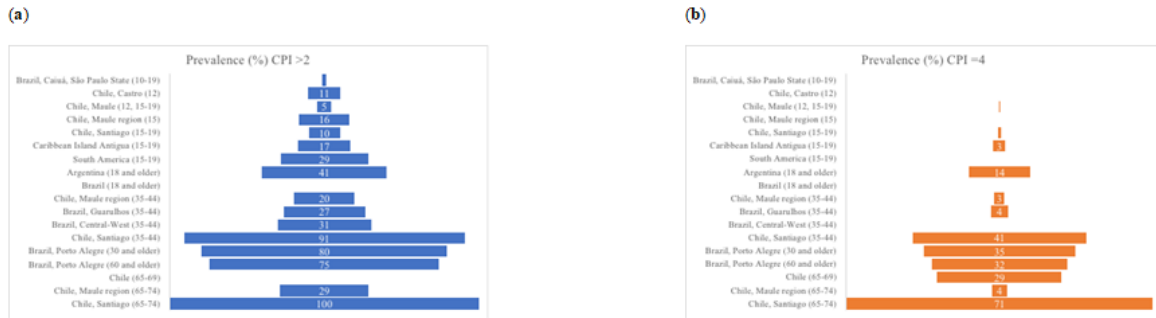

Figure 4. Studies categorized according to prevalence (%) using CPI index criteria, (**a**) CPI>2 and (**b**) CPI=4, ordered by age.
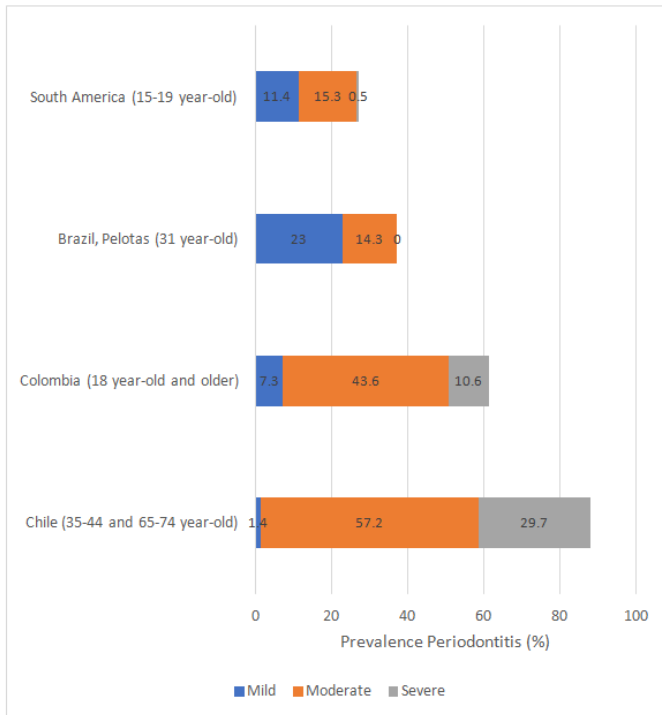
520

Figure 5. Stacked bar charts showing the prevalence of periodontitis in adolescents or adults according to the studies in Latin-American that used CDC/AAP case definition.

Supplementary material

Supplementary Table 1. Excluded studies after full text revision and with their reasons (n = 46).

Authors, year	Country, City	doi or link	Exclusion criteria
Alonge OK, Narendran S. 1999	St. Vincent and The Grenadines	https://pubmed.ncbi.nlm.nih.gov/11372121/	8
Andrade IT, Rapp GE. 2002	District of Barra / Rio Vermelho, Brazil	https://pubmed.ncbi.nlm.nih.gov/12670092/	5
Barbachan e Silva B, Maltz M. 2001	Porto Alegre, Brazil	https://pubmed.ncbi.nlm.nih.gov/11705268/	4
Bonanato K, et al. 2010	Belo Horizonte, Minas Gerais, Brazil	https://pubmed.ncbi.nlm.nih.gov/20589245/	2
Carvajal P, et al. 2016	South America	doi: 10.1590/1678-775720160178.	2
Castrejón-Pérez RC, et al. 2017	Mexico	doi: 10.1093/gerona/glw201	3
Chiapinotto FA, et al. 2012	Brazil, Pelotas	doi: 10.1111/jphd.12001	5
Collins J R, et al. 2019	Caribbean. Jamaica, Dominican Republic, and Puerto Rico.	doi: 10.1186/s12903-019-0931-1	4
Cortelli JR, et al. 2008	Brazil	doi: https://doi.org/10.14295/bds.2008.v11i2.448.	3
Cyrino RM, et al. 2011	Belo Horizonte, Brazil	doi: 10.1902/jop.2011.110015.	3
da Mota JC, et al. 2014	Minas Gerais, Brazil	doi: 10.1590/1413-81232014197.09312013.	4
de Medeiros TCC, et al. 2022	Brazil	doi: 10.1002/JPER.21-0433.	4
de Souza SL, Taba M Jr. 2004	Brazil	doi: 10.1590/s0103-64402004000100009.	3
Duque A. 2016	Latin America	http://dx.doi.org/10.1016/j.piro.2016.07.005.	1
Elías-Boneta AR, et al. 2017	San Juan, Puerto Rico	https://pubmed.ncbi.nlm.nih.gov/28915302/	3
Elías-Boneta AR, et al. 2018	Caribbean. Jamaica, Dominican Republic, and Puerto Rico.	https://pubmed.ncbi.nlm.nih.gov/29905923/	2
Feldens EG, et al. 2006	Canoas, Brazil	https://pubmed.ncbi.nlm.nih.gov/16734306/	5
Giacaman RA, et al. 2015	Maule, Chile	https://pubmed.ncbi.nlm.nih.gov/26108477/	4
Giacaman RA, et al. 2018	Maule, Chile	doi: 10.22605/RRH4312.	6
Gianopoulos V, et al. 2014	Santa Ana, Nicaragua	doi: 10.1111/idh.12043	3
Haas AN, et al. 2015	Brazil	doi: 10.1590/1980-5497201500020018	4
Haas AN, et al. 2019	Brazil, Porto Alegre	doi.org/10.1590/1807-3107bor-2019.vol33.0036	2
Ismail AI, Szpunar SM. 1990	Mexican Americans, Cuban Americans, and Puerto Ricans	doi: 10.2105/ajph.80.suppl.66.	7
Lock NC, et al. 2020	Brazil, Porto Alegre	doi: 10.1111/jre.12743	2
Lopez R, et al. 2002	Santiago, Chile	doi: 10.1034/j.1600-0765.2002.01377.x.	2
Lorenzo-Erro SM, et al. 2022	Uruguay	doi: 10.54589/aol.35/3/178.	2
Lorenzo-Erro SM, et al. 2018	Uruguay	doi: 10.1590/1807-3107bor-2018.vol32.0062.	7
Maltz M, et al. 2001	Porto Alegre, Brazil	doi: 10.1007/s007840100122.	4
Medina-Solís CE, et al. 2014	Mexico	doi: 10.3390/ijerph110303169	4
Moreira Rda S, et al. 2009	Southeastern Sao Paulo State, Brazil	doi: 10.1590/s1678-77572009000300008.	4

Moreno de Calafell M, Esper ME. 2003	Argentina	https://pesquisa.bvsalud.org/portal/resource/pt/lil-349312	8
Nobre CM, et al. 2016	Brazil	doi: 10.1007/s40368-016-0248-6.	3
Peres MA, et al. 2012	Pelotas, Brazil	doi: 10.1902/jop.2011.110250.	4
Rapp GE, et al. 2001	Bahia, Brazil	https://pubmed.ncbi.nlm.nih.gov/12666945/	3
Raulino do Nascimento A, et al. 2022	Brazil	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9568304/	4
Rebelo MA, et al. 2009	Manaus, AM, Brazil	doi: 10.1590/s1806-83242009000300005.	2
Rojo Botello NR, et al. 2011	Mexico	https://www.scielo.org.mx/scielo.php?script=sci_arttext&pid=S1870-199X2011000100006	3
Sabogal A, et al. 2019	Peru	doi: 10.1155/2019/2357013	3
Santosh ABR, et al. 2020	Caribbean. Jamaica, Dominican Republic, and Puerto Rico.	doi: 10.1177/0272684X19895901.	4
Segundo TK, et al. 2004	Contagem, Minas Gerais, Brazil	doi: 10.1590/s0102-311x2004000200029.	3
Silva-Boghossian CM, et al. 2011	Brazil	https://pubmed.ncbi.nlm.nih.gov/22068186/	3
Strauss FJ, et al. 2009	Chile	doi.org/10.1186/s12903-019-0975-2	6
Susin C, Albandar JM. 2005	Brazil, Porto Alegre	doi: 10.1902/jop.2005.76.3.468	2
Teixeira FCF, et al. 2019	Sao Paulo, Brazil	https://doi.org/10.6084/m9.figshare.11314157.v1	3
Teixeira FCF, et al. 2020	Sao Paulo, Brazil	doi: 10.1590/1807-3107bor-2020.vol34.0058	3
Tinoco EM, et al. 1997	Brazil	doi: 10.1111/j.1600-0722.1997.tb00174.x.	2

Reasons for exclusion: 1 - Reviews; 2 - Unclear or unsuitable case definition; 3 - Convenience sample; 4 - Lack prevalence data; 5 - Children population <12-year-old; 6 - Same data from other study; 7 - Unrelated; 8 - Full text not accessed.

530