



Socioeconomic Position and Dental Caries in Latin America: A Systematic Review

Salinas Goodier Carmen¹, López Torres Rómulo Guillermo², Lozada López Fanny del Rocío³, Armijos Briones Fernando Marcelo⁴

¹Universidad Regional Autónoma de los Andes UNIANDES, Ambato, Ecuador.

Email: ua.carmensalinas@uniandes.edu.ec

ORCID ID: 0000-0001-5601-9008

²Universidad Regional Autónoma de los Andes UNIANDES, Ambato, Ecuador.

Email: ua.romulolopez@uniandes.edu.ec

ORCID ID: 0000-0001-9656-3876

³Universidad Regional Autónoma de los Andes UNIANDES, Ambato, Ecuador.

Email: ua.fannylozada@uniandes.edu.ec

ORCID ID: 0000-0002-2805-1497

⁴Universidad Regional Autónoma de los Andes UNIANDES, Ambato, Ecuador.

Email: ua.fernandoarmijos@uniandes.edu.ec

ORCID ID: 0000-0002-5500-4768

*Corresponding author's E-mail: ua.carmensalinas@uniandes.edu.ec

Article History	Abstract
Received: 06 June 2023 Revised: 25 August 2023 Accepted: 02 Sept 2023	<p>People who are in a bad socioeconomic position usually experience bad health outcomes. Moreover, higher mortality rates are linked to deteriorating socioeconomic status. This trend can also be observed in oral health. Worldwide, the highest prevalence of disease caries in permanent teeth was observed in Andean Latin America. The aim of this review was to determine the risk of caries based on the socioeconomic position in Latin America. The protocol was designed in accordance with the Cochrane standards for systematic reviews. The search criteria met the Preferred Reporting Items for Systematic reviews and Meta-Analysis Protocols (PRISMA) guidelines. A total of 152 articles were reviewed. Finally, 9 studies were included in the review. There is a direct association between socioeconomic status, parents' educational level, family income, and oral health education and patients' caries experience. Furthermore, this review highlights the lack of research in Latin America on oral health and the lack of policies based on scientific evidence to try to reduce the caries rate in the pediatric and adult population.</p>
CC License CC-BY-NC-SA 4.0	Keywords: Dental caries, Socioeconomic position, Latin America.

1. Introduction

Overall, people who are worse off socioeconomically have worse health outcomes and higher mortality rates than those who are better off. This trend can also be observed in oral health. (1). Universal health must underlie the values of equity, solidarity and the right to health. However, there

Socioeconomic Position and Dental Caries in Latin America: A Systematic Review

are economic, sociocultural, geographical and gender barriers that hinder access to services that must be eliminated. (2).

The universal health strategy is the foundation for improving the health and well-being of all people; strengthening health systems; increase their resilience and responsiveness to current and future challenges; and promote intersectoral initiatives to address the social, economic and environmental determinants of health. This strategy rests on the foundation of the right to health, which is fundamental to our human rights and to our understanding of life lived with dignity. (2). Poverty and social exclusion are two indicators of socioeconomic position commonly used in Latin America. Poverty imposes restrictions on the material conditions of daily life, limiting access to fundamental pillars of health, such as adequate housing, good nutrition and the opportunity to maintain optimal personal hygiene. (3). Social exclusion prevents people from participating in education or training and accessing citizenship services and activities. Being excluded from society and being treated as less than equal leads to poorer health and higher risks of premature death. (4).

There is a large number of people getting affected by untreated dental caries. In addition, severe periodontitis and edentulism diseases amount to 3,500 million in the world (6). Globally, the highest prevalence (7.4%) and incidence (5.9 million new cases) of total tooth loss is observed in Tropical Latin America. The highest prevalence of caries in permanent teeth was observed in Andean Latin America (54.9%), while severe chronic periodontitis (10.5%) was more prevalent in western sub-Saharan Africa. Of note, Tropical Latin America was the only region with a significantly higher prevalence and incidence of untreated caries in permanent teeth, severe periodontal disease and total tooth loss, compared to global averages in 2015 versus previous studies. (6). According to Kassebaum et al. (6), a more than 100% increase in the rate of disability-adjusted life years due to oral conditions was observed in 4 regions of Africa and 3 regions of South America between 1990 and 2015. However, it should be emphasized that this significant increase may be due to an increase in data recording and not necessarily reflect reality to the same extent.

The objective of this review was to determine the risk of developing carious lesions as a function of socioeconomic position in Latin America.

2. Materials And Methods

A Protocol:

The protocol was designed according to Cochrane standards for systematic reviews. The search criteria met the guidelines Preferred Reporting Items for Systematic reviews and Meta-Analysis Protocols (PRISMA) (8).

Inclusion and exclusion criteria:

The inclusion criteria were: studies published in the last 5 years, studies conducted on adults or children with permanent or deciduous teeth, studies conducted in Latin America, studies conducted in Spanish, English or Portuguese, studies addressing risk factors for dental caries, studies reporting on socioeconomic factors or indicators, studies reporting on CAOD/ceo-d.

The exclusion criteria were: studies older than 5 years, conducted on animals, studies without statistical analysis, studies in a language other than Spanish, English or Portuguese, analytical studies that did not associate dental caries rates with socioeconomic indicators and studies conducted in geographical regions other than Latin America.

Search strategy:

We searched the following databases from 2016 to 26 October 2021: 1) MEDLINE via PubMed, 2) LILACS and 3) Elsevier via ScienceDirect. The search strategy used was: (*caries OR decay*) AND (*socioeconomic position OR socioeconomic status*) AND (*Latin America or South America*).

Study Eligibility and Data Extraction:

Full texts of potentially relevant studies were screened to answer the research question. A matrix was generated for data extraction from selected studies.

The matrix had the following fields: authors, year of publication, country, mean age, prevalence of CAOD/ceo-d>0, mean CAOD/ceo-d and type of socioeconomic indicators used.

Analyzed result

Studies investigating the association between educational or occupational background or parental or personal income and the prevalence, experience, or incidence of dental caries.

The selected studies must have analysed the clinical parameters of dental caries. It was not predetermined how caries needed to be assessed (e.g., assessment of only dentin lesions or both enamel and dentin, clinically or radiographically determined caries, etc.), as different valid methods are currently used (9). The association between socioeconomic position (educational background, own or household income, own or parental occupation) and caries was analyzed.

Estimates of dental caries were classified as follows:

- Prevalence of caries (percentage of a population with untreated caries lesions, e.g. "C" component of the CPOD> 0)
- Presence of any caries experience (percentage of a population with some caries experience, i.e. with POCD> 0)
- Incidence of caries (increase in caries lesions or number of active lesions).

3. Results and Discussion

A total of 152 articles were reviewed, 129 studies were excluded based on the title, 9 based on the information found in the abstract and 5 after reading the articles in full text. Finally, 9 studies were included in the review. The diagram flow can be seen in Figure 1.

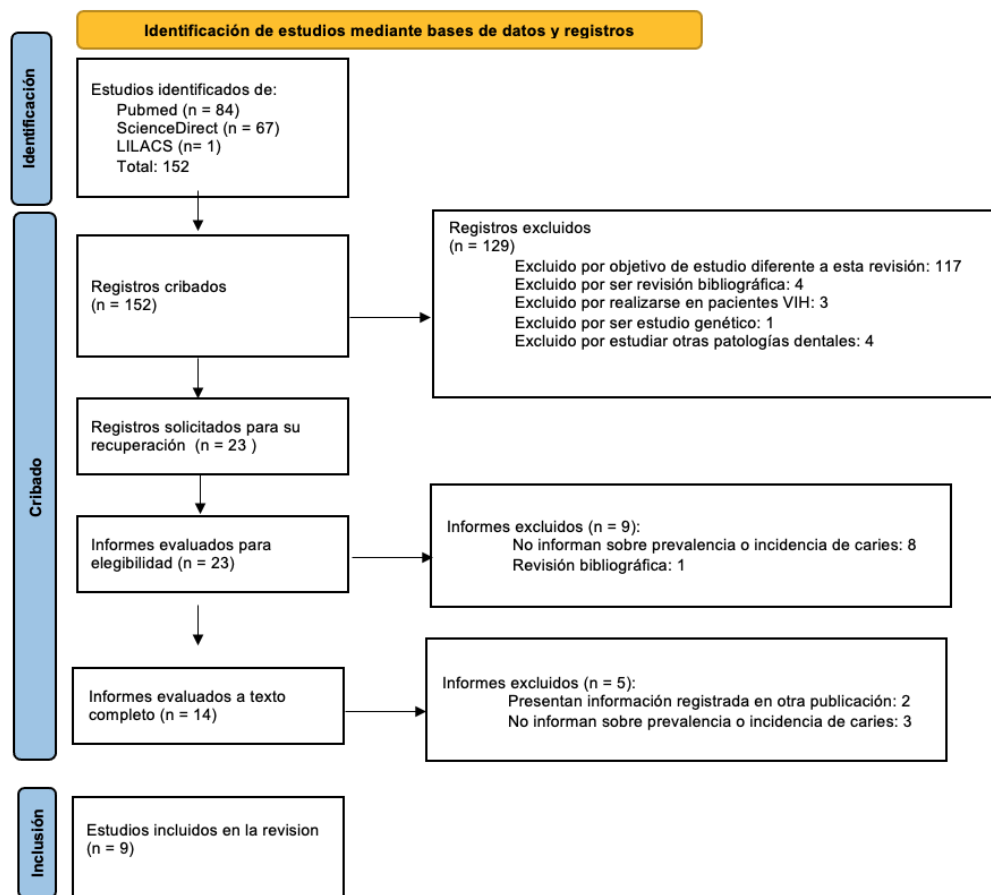


Figure 1. Flowchart of the present review. Adapted from Page et al. (8)

The main results of this review can be found in Table 1.

Socioeconomic Position and Dental Caries in Latin America: A Systematic Review

Board 1. Main results of this review. n= number of participants, CAOD = Number of decayed, missing and filled teeth, ceo-d = decayed deciduous teeth, with indication of extraction and filled.

Author	Year	Country	n	Age (average)	CAOD/ceo-d >0 (%)	CAOD/ceo-d (mean (SD))
Chaffe et al. (10)	2017	Brazil	456	38.8 months	39.7	1.54 (2.77)
Martignon et al. (11)	2018	Colombia	316	8-71 months	37.41	1.4 (2.5)
Meira et al. (12)	2020	Brazil	768	12 years	41.9	-
Barreto et al.(13)	2020	Brazil	1367	6.5 years	53.3	1.91
Brito et al. (14)	2020	Brazil	27295	12 years	57.6	-
Pilecco et al. (15)	2020	Brazil	1134	14.33 years	42.06	-
Neves et al. (16)	2020	Brazil	740	12 years	88.2	-
Amato et al. (17)	2021	Brazil	5213	5 years	44.5	1.29 (2.16)
Nunes et al. (18)	2017	Brazil	426	5 years	52.35	-

Chaffe et al. They found that the experience of caries was more severe in children from families with a lower socioeconomic level, with statistically significant differences in the CAOD index associated with maternal education (greater number of caries associated with fewer years of schooling of the mother), social class (greater number of caries associated with lower social class) and family income (greater number of caries associated with lower economic income) (10,18). Martignon et al. (11) They also found statistically significant differences between the parents' level of education with the presence of caries. The risk of untreated caries was 1.9 times higher when the parents' maximum educational level was primary school compared to children whose parents completed secondary education. In addition, significant associations were found between social class, the presence of untreated caries, and the number of decayed teeth or teeth that required extraction. (13).

The socioeconomic position not only influences the dental pathology present, but also significant differences were found between children with different socioeconomic position in terms of the number of visits to the dentist and the dental anxiety they presented. A child with a worse socioeconomic position was more likely to have never visited the dentist and to have dental anxiety compared to a child with a better socioeconomic position (13).

In addition, a higher rate of caries was associated with female sex, non-white ethnicity and the presence of gingival bleeding (14). According to the analysis carried out by Pilecco et al. (15), sex, skin color, age, parental education, number of visits to the dentist, were associated with the number of filled teeth (15).

Neves et al. (16), observed that there was a higher prevalence of caries if the last dental consultation was in public services rather than in private services. A higher prevalence of caries was also found the greater the number of residents in the home, the lower the knowledge about this pathology and when the patient belonged to a dysfunctional family nucleus. (16).

There are other variables that are associated with a higher rate of caries such as the percentage of homes with non-potable water, percentage of families living on up to a minimum wage and the teething stage. The results indicate a 6% increase in the odds of experiencing caries at the community level for each additional percentage of homes with unsafe water. In addition, there was a 3% increase in the odds of having cavities for each additional percentage of families living on up to minimum wage. (17,18).

This review found several factors that will increase the risk of caries at some point in life: socioeconomic status, educational level of parents, social class, family income, number of visits to the dentist, female sex, non-white ethnicity and access to drinking water (10–16).

In addition, low-income families may encounter financial constraints regarding improving their oral health by purchasing preventative materials, such as toothbrushes and fluoride toothpaste.

This review was not intentionally directed towards the paediatric population, however there were no studies conducted in adults that met the inclusion criteria. This in itself throws us a question: with caries being one of the most prevalent preventable diseases in the population of Latin America, how can it be that there are no more studies?

Other studies yielded information regarding the education received on caries prevention and low knowledge about oral health was associated with higher prevalence among patients from lower and lower-middle social classes. In addition, the use of dental services for emergencies and/or dental pain was associated with low knowledge about oral health, as well as toothbrushing less than twice a day, higher prevalence of severe impact on quality of life and presence of untreated caries (19).

The objective and priorities pursued by European countries establish that at least 80% of children aged 5 to 6 years should be free of caries. None of the studies in this review reported a caries index that met this condition. However, it should be considered that global targets in terms of absolute values are limited and, instead, health management and planning at local and national levels should formulate realistic goals for the oral health of each community. (17). The prevalence of children with caries in this sample was higher than that stipulated by the World Health Organization – WHO for the year 2000 in Latin America, whose objective was that 50% of children between 5 and 6 years old were free of caries.

The behavioral/cultural explanation should also be taken into account, which emphasizes behavioral and lifestyle choices and suggests that people of low socioeconomic status are more likely to engage in poor health behaviors, such as high sugar intake, infrequent dental visits, and poor oral hygiene practices. (20). In a study conducted by Piva et al., they observed that despite having access to free dental care, children from families of a low socioeconomic status do not always seek care and free access to a dentist does not necessarily improve the oral health status of the population. (21)

4. Conclusion

There is a direct association between socioeconomic status, parents' educational level, family income, and patients' oral health education and caries experience. It is necessary, in addition to guaranteeing access to health, to create education and prevention programs for dental pathologies. In addition, this review highlights the lack of research in Latin America on oral health at the community level and the lack of policies based on scientific evidence to try to reduce the rate of caries in pediatric and adult populations.

References:

1. Delgado-Angulo EK, Hobdell MH, Bernabé E. Poverty, social exclusion and dental caries of 12-year-old children: A cross-sectional study in Lima, Peru. *BMC Oral Health*. 2009;9(1):6–11.
2. Martínez-Piedra R, Quintanilla GF, González MA, Ade MP, Aldighieri S, Almirón M, et al. *Health in the Americas 2017 Edition*. Unpublished. 2017.
3. CSDH. Closing the gap in a generation: health equity through action on the social determinants of health. Final Report of the Commission on Social Determinants of Health. *World Heal Organ*. 2009;57(4):227–30.
4. Abramo L, Cecchini S, Ullmann H. Addressing health inequalities in latin america: The role of social protection. *Cienc e Saude Coletiva*. 2020;25(5):1587–98.
5. Economic Commission for Latin America and the Caribbean. *Social panorama of Latin America 2019*. ECLAC. 2019. 264 p.
6. Kassebaum NJ, Smith AGC, Barnabas E, Fleming TD, Reynolds AE, Vos T, et al. Global, Regional, and National Prevalence, Incidence, and Disability-Adjusted Life Years for Oral Conditions for 195 Countries, 1990-2015: A Systematic Analysis for the Global Burden of Diseases, Injuries, and Risk Factors. *J Dent Res*. 2017;96(4):380–7.
7. Sampaio FC, Böneckerm M, Paiva SM, Martignon S, Filho APR, Pozos-Guillen A, et al. Dental caries prevalence, prospects, and challenges for Latin America and Caribbean countries: a summary and final recommendations from a Regional Consensus. *Braz Oral Res*. 2021;35(c):1–15.
8. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: An updated guideline for Reporting systematic reviews. *BMJ*. 2021;372.
9. Schwendicke F, Dörfer CE, Schlattmann P, Page LF, Thomson WM, Paris S. Socioeconomic inequality and caries: A systematic review and meta-analysis. *J Dent Res*. 2015;94(1):10–8.
10. Chaffe BW, Rodrigues PH, Kramer PF, Vitolo MR, Feldens CA. Oral health-related quality of life measures: variation by socioeconomic status and caries experience. *Researched by Community Dent Oral Epidemiol*. 2017;45(3):216–24.
11. Martignon S, Usuga-Vacca M, Cortés F, Cortes A, Gamboa LF, Jacome-Lievano S, et al. Risk factors for early childhood caries experience expressed by ICDAS criteria in Anapoima, Colombia:

- a cross-sectional study. *Acta Odontol Latinoam* [Internet]. 2018;31(1):58–66. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/30056468>
12. MEIRA GF, KNORST JK, MARONEZE MC, ORTIZ FR, ARDENGHI TM. Effect of dental caries and socioeconomic status on social capital throughout adolescence: a 6-year follow-up. *Braz Oral Res.* 2020;34:1–10.
 13. Barreto KA, Colares V. The social status associated with dental experience among Brazilian children. *Cienc e Saude Coletiva.* 2020;25(10):3913–9.
 14. Brito ACM, Bezerra IM, Cavalcante DDFB, Pereira AC, Vieira V, Montezuma MF, et al. Dental caries experience and associated factors in 12-year-old-children: A population based-study. *Braz Oral Res.* 2020;34:1–10.
 15. Pilecco RO, Godois LDS, Maroneze MC, Ortiz FR, Ardenghi TM. Factors associated with the number of filled teeth in adolescents from public schools: A cohort study. *Braz Oral Res.* 2019;33:1–9.
 16. Neves ÉTB, Dutra L da C, Gomes MC, Paiva SM, de Abreu MHNG, Ferreira FM, et al. The impact of oral health literacy and family cohesion on dental caries in early adolescence. *Community Dent Oral Epidemiol.* 2020;48(3):232–9.
 17. Amato JN, Eskenazi EMDS, Ribeiro SB, Guerrero SLP, Fonseca FLA, Castelo PM. Examining the Relationship between Social and School Environment and Children's Caries Experience Using Primary and Secondary Data: A Cluster Analysis. *Caries Res.* 2021;55(2):79–87.
 18. Nunes VH, Perosa GB. Dental decay in 5-Year-Old children: Sociodemographic factors, monitoring points and parental attitudes. *Cienc e Saude Coletiva.* 2017;22(1):191–200.
 19. Batista MJ, Lawrence HP, De Sousa MDLR. Oral health literacy and oral health outcomes in an adult population in Brazil. *BMC Public Health.* 2017;18(1):1–9.
 20. Singh A, Peres MA, Watt RG. The Relationship between Income and Oral Health: A Critical Review. *J Dent Res.* 2019;98(8):853–60.
 21. Piva F, Pereira JT, Luz PB, Hashizume LN, Hugo FN, de Araujo FB. A longitudinal study of early childhood caries and associated factors in Brazilian children. *Braz Dent J.* 2017;28(2):241–8.
 22. Sisson KL. Theoretical explanations for social inequalities in oral health. *Community Dent Oral Epidemiol.* 2007;35(2):81–8