

Oral health outcomes among populations living in informal urban, rural, and refugee settlements: a systematic review and meta-analysis

Desfechos de saúde bucal em populações que vivem em assentamentos urbanos informais, rurais e de refugiados: uma revisão sistemática e meta-análise

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ABSTRACT

Aim: To assess oral health outcomes among populations living in informal urban, rural, and refugee settlements.

Methods: This systematic review was conducted in accordance with the PRISMA 2020 reporting guidelines and followed the methodological guidance of the Joanna Briggs Institute (JBI). Electronic searches were performed in PubMed, Web of Science, Embase, LILACS, Scopus, and PsycINFO up to October 12, 2024. Observational studies evaluating oral health outcomes among individuals residing in socially vulnerable settlements were eligible for inclusion. Study selection and risk of bias assessment were independently conducted using the JBI critical appraisal checklist for analytical cross-sectional studies. Data were narratively synthesized. When methodological homogeneity was identified, meta-analyses of dichotomous outcomes were performed using a random-effects model. Pooled prevalence estimates with 95% confidence intervals (95% CI) were calculated, and statistical heterogeneity was assessed using the I^2 statistic. **Results:** The search identified 1,204 records, of which nine studies met the inclusion criteria. The included studies were conducted in South Africa, India, Israel, Greece, and Brazil, and primarily involved children, adolescents, and adults living in socially vulnerable settlement contexts. The main oral health outcomes assessed were dental caries, periodontal conditions, dental pain, and self-perceived oral health. Meta-analysis demonstrated that 84.46% (95% CI: 75.09–91.93; $I^2 = 85.15\%$) of participants had experience of dental caries, 44.74% (95% CI: 38.84–50.72; $I^2 = 69.26\%$) reported dental pain, and 62.81% (95% CI: 41.44–81.84; $I^2 = 97.62\%$) reported negative self-rated oral health. **Conclusion:** Populations living in socially vulnerable settlements experience a substantial burden of dental caries, dental pain, and negative self-rated oral health. Structural vulnerabilities and barriers to accessing oral health services likely contribute to these unfavorable outcomes. Further well-designed longitudinal studies using standardized diagnostic criteria are needed to strengthen the evidence base in this field.

KEYWORDS

Dental health surveys; Human settlements; Oral health; Social determinants of health; Systematic review.

RESUMO

Objetivo: Avaliar os desfechos de saúde bucal em populações que vivem em assentamentos urbanos informais, rurais e de refugiados. **Métodos:** Esta revisão sistemática foi conduzida em conformidade com as diretrizes de relato PRISMA 2020 e seguiu as orientações metodológicas do Joanna Briggs Institute (JBI). Buscas eletrônicas foram realizadas nas bases PubMed, Web of Science, Embase, LILACS, Scopus e PsycINFO até 12 de outubro de 2024. Estudos observacionais que avaliaram desfechos de saúde bucal em indivíduos residentes em assentamentos

socialmente vulneráveis foram considerados elegíveis para inclusão. A seleção dos estudos e a avaliação do risco de viés foram realizadas de forma independente, utilizando a lista de verificação crítica do JBI para estudos transversais analíticos. Os dados foram sintetizados de forma narrativa. Quando identificada homogeneidade metodológica, meta-análises de desfechos dicotômicos foram conduzidas por meio de modelo de efeitos aleatórios. Estimativas de prevalência combinadas com intervalos de confiança de 95% (IC 95%) foram calculadas, e a heterogeneidade estatística foi avaliada por meio da estatística I^2 . **Resultados:** A busca identificou 1.204 registros, dos quais nove estudos atenderam aos critérios de inclusão. Os estudos incluídos foram conduzidos na África do Sul, Índia, Israel, Grécia e Brasil, envolvendo principalmente crianças, adolescentes e adultos que vivem em contextos de assentamentos socialmente vulneráveis. Os principais desfechos de saúde bucal avaliados foram cárie dentária, condições periodontais, dor dentária e autopercepção da saúde bucal. A meta-análise demonstrou que 84,46% (IC 95%: 75,09-91,93; $I^2 = 85,15\%$) dos participantes apresentaram experiência de cárie dentária, 44,74% (IC 95%: 38,84-50,72; $I^2 = 69,26\%$) relataram dor dentária e 62,81% (IC 95%: 41,44-81,84; $I^2 = 97,62\%$) relataram autopercepção negativa da saúde bucal. **Conclusão:** Populações que vivem em assentamentos socialmente vulneráveis apresentam elevada ocorrência de cárie dentária, dor dentária e autopercepção negativa da saúde bucal. Vulnerabilidades estruturais e barreiras de acesso aos serviços de saúde bucal possivelmente contribuem para esses desfechos desfavoráveis. São necessários estudos longitudinais bem delineados, utilizando critérios diagnósticos padronizados, para fortalecer a base de evidências nesta área.

PALAVRAS-CHAVE

Assentamentos humanos; Determinantes sociais da saúde; Levantamentos de saúde bucal; Revisão sistemática; Saúde bucal

INTRODUCTION

The conditions in which individuals live and carry out their daily activities strongly influence whether diseases develop, as well as their progression and severity [1,2]. Settlements are residential contexts in which specific populations reside either temporarily or permanently, often shaped by complex historical, political, and social processes [3]. Many of these settings are characterized by inadequate sanitation infrastructure [4], limited access to safe drinking water [5,6], environmental exposure to pesticides [7,8], and geographic or structural barriers to health care services. These factors collectively exacerbate social vulnerability and negatively affect the overall health of residents [9,10].

Settlements have been defined as residential areas formed through social, political, or migratory processes, typically characterized by precarious housing structures (informal constructions, tents, containers, or self-built dwellings), limited access to basic sanitation and potable water, restricted availability of health services, and socioeconomic marginalization [3-11]. These contexts include informal urban settlements, as defined by the United Nations Human Settlements Programme as areas lacking adequate housing and essential infrastructure [11], rural settlements, where individuals seeking agrarian reform live [3], as well as refugee settlements resulting from forced

displacement, in accordance with the terminology of the United Nations High Commissioner for Refugees [12].

Oral diseases constitute a major global public health challenge. Untreated oral conditions affect approximately 3.5 billion people worldwide, with untreated dental caries in permanent teeth representing the most prevalent health condition globally [13]. Severe periodontal disease affects hundreds of millions of individuals and remains a leading cause of tooth loss in adults [13]. Although improvements in oral health indicators have been observed in high-income countries, the overall burden of oral diseases remains disproportionately concentrated among socially and economically disadvantaged populations [13-15]. This unequal distribution is strongly influenced by social determinants of health, including income, education, housing conditions, sanitation, and access to health services [2,16], which shape both exposure to risk factors and access to preventive and curative care. Consistent associations have been reported between lower socioeconomic status and higher prevalence of dental caries, destructive periodontal disease, and other oral conditions [14,15,17].

Given the structural vulnerabilities inherent to settlement contexts and the lack of comprehensive synthesized evidence on this topic, a systematic evaluation of the literature on the oral health

outcomes in these populations is warranted. Therefore, the aim of this study was to conduct a systematic review and meta-analysis to assess oral health outcomes among populations living in informal urban, rural, and refugee settlements.

MATERIALS AND METHODS

Protocol

This systematic review was registered in the PROSPERO database (ID: CRD42022377609) and was conducted in accordance with the methodological guidance for systematic reviews issued by the Joanna Briggs Institute (JBI) [18]. The reporting of the systematic review complies with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [19].

Research question

The research question (What is the oral health status of populations living in settlements?) was formulated based on the Population-Exposure-Outcome (PEO) framework. The population comprised individuals of all age groups, the exposure was defined as residence in a settlement context, and the outcome of interest was oral condition.

Databases and search strategy

A comprehensive electronic search was conducted in the PubMed, Web of Science, Embase, LILACS, Scopus, and PsycINFO databases. The final search was performed on October 12, 2024, without restrictions on publication date or language. The search strategy combined controlled vocabulary terms (MeSH) and free-text keywords related to settlement contexts and oral health conditions. The search strategy included the following terms: Human Settlement OR Settlement AND Oral Health OR Tooth Diseases OR Mouth Diseases OR dental caries OR Carious Lesion OR dental decay OR caries disease OR root caries OR tooth caries OR tooth decay OR dental fissure OR DMFS OR dmfs OR DMFT OR dmft OR ICDAS OR periodontal disease OR gingival disease OR pyorrhea OR gum disease OR periodontitis OR gingivitis OR parodontosis OR periodontal pocket OR periodontal abscess OR dental plaque OR probing depth OR bleeding on probing OR plaque index OR gingival index

OR periodontal index OR attachment level OR gingival bleeding OR VPI OR GBI OR API OR Tooth Loss OR Edentulous OR Edentulism. In addition, the reference lists of included studies were manually screened to identify potentially relevant publications.

Study selection

The study selection process followed the recommendations of PRISMA 2020 [19] and was conducted in a structured and sequential manner. Records retrieved from the electronic databases were exported to EndNote Web (©2024 Clarivate), and duplicate records were removed automatically. Subsequently, two reviewers (SB and JG) independently screened the titles and abstracts of the remaining records according to the predefined eligibility criteria. Full-text versions of potentially eligible studies were then retrieved and independently assessed by the same reviewers to determine final inclusion. The reviewers worked independently during both screening phases. Disagreements regarding study inclusion were resolved through discussion and consensus, and when consensus could not be reached, a third reviewer (LV) was consulted to make the final decision. Studies meeting all eligibility criteria were included in the qualitative synthesis, and those reporting methodologically comparable dichotomous outcomes were incorporated into the quantitative meta-analysis when appropriate.

Eligibility criteria

Eligibility criteria were defined according to the PEO framework. Observational studies, including cross-sectional, cohort, and case-control designs, that evaluated oral health outcomes among individuals residing in settlement contexts were considered eligible. The population included individuals of any age or sex living in informal urban settlements, rural agrarian reform settlements, or refugee settlements. The exposure of interest was residence in a socially vulnerable settlement context. Outcomes included objective and/or subjective oral health measures, such as dental caries indices (DMFT/dmft), periodontal indices (CPI, CPITN), dental pain, tooth loss, treatment needs, and self-rated oral health. No restrictions were applied regarding year of publication or country. Studies involving fossil or historical populations, studies not reporting specific oral health outcomes, review articles,

editorials, case reports, and conference abstracts were excluded.

Data extraction

Data were extracted using a standardized spreadsheet developed in Microsoft Excel 2010. The extracted information included the authors and year of publication, the country in which the settlement was located, study design, sample size, population characteristics (including age group and description of the settlement context), oral health outcomes assessed, diagnostic criteria or indices used (such as DMFT/dmft, CPI, and CPITN), and the main quantitative results reported by each study, including prevalence, mean values, and distribution of outcomes. The extraction process focused on characterizing the study populations and oral health indicators evaluated, enabling qualitative synthesis and, when appropriate, quantitative pooling of comparable dichotomous outcomes.

Risk of bias assessment

Risk of bias was independently assessed by two reviewers (SB and AG) using the JBI critical appraisal checklist for analytical cross-sectional studies. Each study was evaluated across eight methodological domains addressing sampling procedures, measurement validity and reliability, identification of potential confounding factors, and appropriateness of statistical analysis. Disagreements between reviewers were resolved through discussion and, when necessary, consultation with a third reviewer (LV).

Summary of results and statistical analysis

A narrative synthesis of the included studies was initially conducted, grouping findings according to the type of oral health outcome assessed. When methodological homogeneity among studies in terms of the oral health outcome evaluated was identified, information on the number of individuals with a specific oral outcome and information on the total number of individuals in each study was collected and meta-analyses were performed. Pooled prevalence estimates with corresponding 95% confidence intervals (95% CI) were calculated using a random-effects model, considering the anticipated clinical and methodological variability across studies. Meta-analyses were conducted using MedCalc Statistical Software version

19.2.6 (MedCalc Software, Ostend, Belgium). Statistical heterogeneity was assessed using the I^2 statistic, which estimates the proportion of total variation across studies attributable to heterogeneity rather than chance. I^2 values were interpreted as low (<25%), moderate (25-75%), or high (>75%) heterogeneity.

Certainty of the evidence assessment

For the three meta-analyses, the certainty of the evidence was assessed. Number of studies, whose data were incorporated into meta-analysis, study design, risk of bias, inconsistency, indirectness, imprecision, and publication bias were evaluated. Information on the summary of the findings was also provided. The evidence certainty could be very low, low, moderate or high. The software GRADEpro was used [20].

RESULTS

Article selection

The database search identified 1,204 records. After removal of duplicate references ($n = 253$), 951 records remained for screening. Following title and abstract screening, 911 records were excluded for not meeting the predefined eligibility criteria. The full texts of the remaining articles were assessed for eligibility, and 31 were excluded for failing to meet the inclusion criteria. Ultimately, nine studies fulfilled all eligibility criteria and were included in the qualitative synthesis. Of these, seven reported methodologically comparable dichotomous outcomes and were therefore included in the quantitative synthesis (meta-analysis). The complete study selection process is presented in Figure 1.

Characteristics of included studies

Nine studies were included in the qualitative synthesis. The studies were published between 1998 and 2024 and were conducted in Brazil ($n = 3$), South Africa ($n = 3$), Greece ($n = 1$), India ($n = 1$), and Israel ($n = 1$). The studies adopted a cross-sectional design, and sample sizes ranged from 70 to 557 participants.

The populations investigated comprised children, adolescents, and adults residing in socially vulnerable settlement contexts, including informal urban settlements, rural agrarian

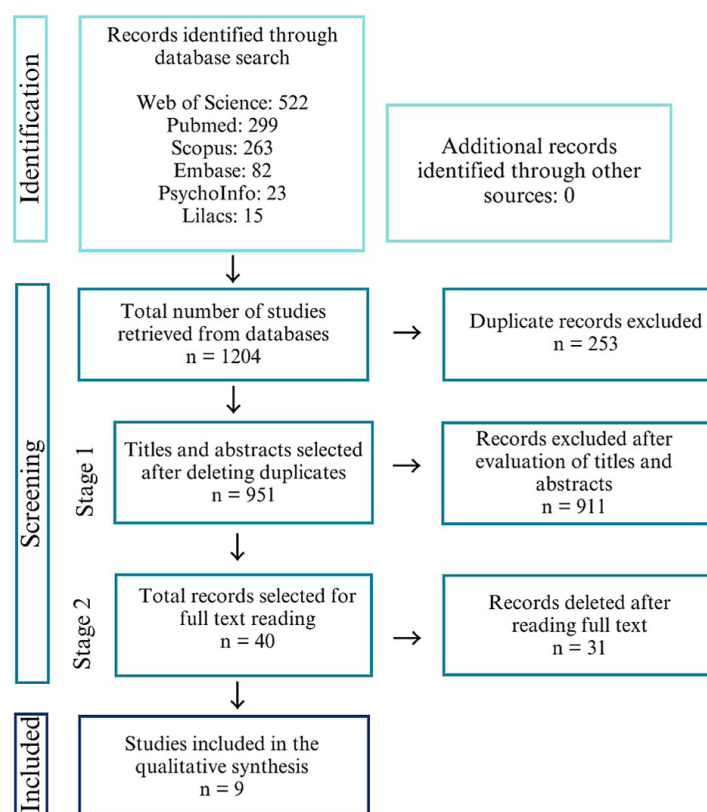


Figure 1 - Flowchart of study selection process. Adapted from Page et al. [19].

reform settlements, and refugee settlements. The oral health outcomes assessed included dental caries (measured using DMFT/dmft indices), periodontal conditions, tooth loss, malocclusion, dental pain, self-perceived oral health, and access to dental services. Overall, the prevalence of oral diseases was consistently high across studies, although variation was observed according to age group and type of settlement.

Bhayat et al. [21] evaluated dental caries among 169 children aged three to six years living in an informal settlement in South Africa. Bhatt and Gaur [22] investigated dental caries in 254 Tibetan refugees aged six to 18 years residing in a settlement in India. Brijlal and Gordon [23] assessed dental caries and gingival inflammation in 70 children aged two to six years living in an informal settlement in South Africa. Leão et al. [24] examined dental caries, periodontal health, and treatment needs in 180 Brazilian adolescents aged 10 to 19 years residing in a rural settlement. Moimaz et al. [25] evaluated dental caries and periodontal health in 179 Brazilian adolescents aged 11 to 18 years living in a rural settlement. Moura et al. [26] assessed dental caries, dental pain, self-rated oral health, and treatment needs

in 557 Brazilian adults aged 20 to 59 years residing in a rural settlement. Stabholz et al. [27] investigated periodontal status in 412 adults aged ≥ 35 years living in settlements in Israel. Zaheer et al. [28] evaluated self-rated oral health and self-reported oral problems in 156 adult refugees (≥ 18 years) residing in settlements in Greece. Westaway et al. [29] assessed dental pain, self-rated oral health, and self-reported oral problems in 294 Black individuals aged ≥ 12 years living in an informal peri-urban settlement in South Africa.

A summary of study characteristics is presented in Figure 2, and detailed data extraction is provided in Table I.

Oral health outcomes

Dental caries

Six studies investigated dental caries [21-26] using DMFT (decayed, missing, and filled permanent teeth), dmft (decayed, missing, and filled deciduous teeth), caries experience (DMFT/dmft ≥ 1), and related measures.

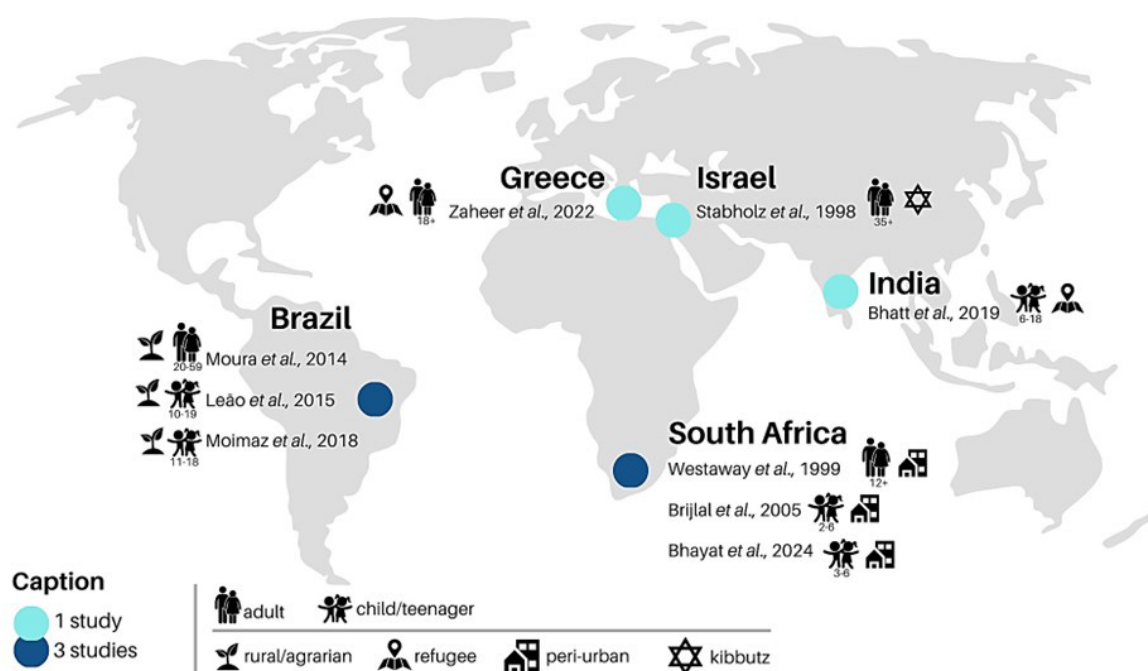


Figure 2 - Characterization of studies included in systematic review.

Table I - Complete extraction of data from studies included in present systematic review

Authors, Country, Study design	Sample (n and characteristics)	Outcome variable/ Indices used	Results
Bhayat et al. [21], South Africa, cross-sectional study.	169 children 3 to 6 years of age living in informal settlement in South Africa.	Prevalence of caries	Prevalence of caries (n = 169)
		overall prevalence	overall prevalence = 39% (n = 66)
		dmft index	dmft index (n = 169)
		3 years	3 years = 0.76 ± 2.03 (n = 59)
		4 years	4 years = 1.60 ± 2.76 (n = 53)
		5 years	5 years = 2.43 ± 3.14 (n = 44)
Bhatt and Gaur [22], India, cross-sectional study.	254 Tibetan refugees 6 to 18 years of living in settlement in India.	6 years	6 years = 2.31 ± 2.75 (n = 13)
		average dmft	average dmft = $1.58 (\pm 2.70)$
		Caries experience	Caries experience
		Mixed dentition	Mixed dentition (n = 75)
		dmft = 0 and DMFT = 0	dmft = 0 and DMFT = 0 = 16% (12)
		dmft >1 and DMFT >1	dmft >1 and DMFT >1 = 84% (63)
Brijlal and Gordon [23], South Africa, cross-sectional study.	70 children 2 to 6 years of age living in informal settlement in South Africa.	Permanent dentition	Permanent dentition (n = 179)
		DMFT = 0	DMFT = 0 = 22.3% (40)
		DMFT > 1	DMFT >1 = 77.3% (139)
		Caries index	Caries index
		Mixed dentition	Mixed dentition
		average dmft average DMFT	average dmft = $3.54 (\pm 4.11)$ average DMFT = $0.92 (\pm 1.06)$
		Permanent dentition	Permanent dentition
		average DMFT	average DMFT = $2.82 (\pm 2.44)$
		Caries experience	Caries experience (n = 70)
		Caries-free	Caries-free = 18.5% (13)
		Caries-infected	Caries-infected = 81.5% (57)
		Caries index	Caries index (n = 70)
		Decayed teeth	Average decayed teeth = 4 (range: 1 and 17)

Table I - Continued...

Authors, Country, Study design	Sample (n and characteristics)	Outcome variable/ Indices used	Results
Brijlal and Gordon [23], South Africa, cross-sectional study.	70 children 2 to 6 years of age living in informal settlement in South Africa.	Gingival inflammation	Gingival inflammation (n = 70)
		Present	Present = 82.8% (58)
		Absent	Absent = 17.2% (12)
		Plaque deposits	Plaque deposits (n = 70)
Leão et al. [24], Brazil, cross-sectional study.	180 Brazilian teenagers 10 and 19 years of age living in rural settlement.	Moderate to abundant	Moderate to abundant = 95.7% (67)
		Absent or mild	Absent or mild = 4.3% (3)
		Caries index	Caries index (n = 180)
		Average DMFT	Average DMFT = 5.49 ($\pm$ 3.33)
		Caries experience	Caries experience (n = 180)
		DMFT = 0	DMFT 0 = 6.7% (12)
		DMFT $\geq$ 1	DMFT $\geq$ 1 = 93.3% (168)
		Community periodontal index (CPI)	Community periodontal index (CPI) (n = 180)
		healthy (CPI = 0)	healthy (CPI = 0) = 62.8% (113)
		gingival bleeding (CPI = 1)	gingival bleeding (CPI = 1) = 28.8% (52)
		dental calculus (CPI = 2)	dental calculus (CPI = 2) = 7.8% (14)
		periodontal pocket 4-5 mm (CPI = 3)	periodontal pocket 4-5 mm (CPI = 3) = 0.6% (1)
		periodontal pocket $\geq$ 6 mm (CPI = 4)	periodontal pocket $\geq$ 6 mm (CPI = 4) = 0% (0)
		Dental treatment needs	Dental treatment needs (n = 180)
		Restoration	Restoration = 86.6% (156)
		Extraction	Extraction = 5.7% (10)
		Endodontic treatment	Endodontic treatment = 5.3% (10)
		Enamel remineralization	Enamel remineralization = 0.8% (1)
		Sealant application	Sealant application = 0.8% (1)
		Fixed prosthesis application	Fixed prosthesis application = 0.8% (1)
Moimaz et al. [25], Brazil, cross-sectional study.	179 Brazilian adolescents 11 to 18 years of age living in rural settlement.	DMFT Index	DMFT Index (n = 179)
		11 years	11 years = 5.1 ($\pm$ 2.8) n = 28
		12 years	12 years = 5.0 ($\pm$ 2.9) n = 31
		13 years	13 years = 5.8 ($\pm$ 4.0) n = 29
		14 years	14 years = 5.3 ($\pm$ 3.4) n = 33
		15 years	15 years = 6.3 ($\pm$ 2.4) n = 12
		16 years	16 years = 5.7 ($\pm$ 3.4) n = 23
		17 years	17 years = 5.2 ($\pm$ 3.8) n = 15
		18 years	18 years = 7.4 ($\pm$ 4.1) n = 8
		Average	Average = 5.5 ($\pm$ 3.3)
		Average decayed teeth	Average number of decayed teeth (n = 179): 4.3 ($\pm$ 3.3)
		Average missing teeth	Average number of missing teeth (n = 179): 0.0 ($\pm$ 0.2)
		Average filled teeth	Average number of filled teeth (n = 179): 1.2 ($\pm$ 1.9)
		Caries experience	Caries experience (n = 179)
		DMFT = 0	DMFT = 0 = 6.7% (12)
		DMFT $>$ 1	DMFT $>$ 1 = 93.3% (167)

Table I - Continued...

Authors, Country, Study design	Sample (n and characteristics)	Outcome variable/ Indices used	Results
Moimaz et al. [25], Brazil, cross-sectional study.	179 Brazilian adolescents 11 to 18 years of age living in rural settlement.	Community periodontal index (CPI)	Community periodontal index (CPI)
		healthy (CPI = 0)	healthy (CPI = 0) = 68.2% (n = 122)
		gingival bleeding (CPI = 1)	gingival bleeding (CPI = 1) = 24.6% (n = 44)
		dental calculus (CPI = 2)	dental calculus (CPI = 2) = 6.7% (n = 12)
		periodontal pocket 4-5 mm (CPI = 3)	periodontal pocket 4-5 mm (CPI = 3) = 0.5% (n = 1)
		periodontal pocket ≥ 6 mm (CPI = 4)	periodontal pocket ≥ 6 mm (CPI = 4) = 0 (n = 0)
		Self-perceived gingival health	Self-perceived gingival health (n = 179)
		Good	Good = 62.6% (n = 112)
		Fair	Fair = 33.0% (n = 59)
		Poor	Poor = 4.4% (n = 8)
Moura et al. [26], Brazil, cross-sectional study.	557 Brazilian adults 20 to 59 years of age living in rural settlement.	Self-assessment of oral health status	Self-assessment of oral health status (n = 557)
		Positive perception of oral health	Positive perception of oral health = 29.5% (n = 164)
		Negative perception of oral health	Negative perception of oral health = 70.5% (n = 393)
		Number of decayed permanent teeth	Number of decayed permanent teeth (n = 557)
		0	0 = 25.7% (n = 143)
		1-3	1-3 = 35.5% (n = 198)
		4 or more	4 or more = 38.8% (n = 216)
		Number of missing permanent teeth	Number of missing permanent teeth (n = 557)
		0	0 = 8.6% (n = 48)
		1-3	1-3 = 69.1% (n = 385)
		4 or more	4 or more = 22.3% (n = 124)
		Number of restored permanent teeth	Number of restored permanent teeth (n = 557)
		0	0 = 76.5% (n = 426)
		1-3	1-3 = 16.1% (n = 90)
		4 or more	4 or more = 7.4% (n = 41)
		Pain perception	Pain perception
		None	None = 59.8% (n = 332)
		Little	Little = 14.1% (n = 78)
		Medium/High	Medium/High = 26.1% (n = 145)
		Self-reported treatment need	Self-reported treatment need
		Yes	Yes = 86.6% (n = 467)
		No	no = 13.4% (n = 72)
Stabholz et al. [27], Israel, cross-sectional study.	412 adults ≥ 35 years of age living in settlements in Israel.	Community Periodontal Index of Treatment Needs (CPITN)	Community Periodontal Index of Treatment Needs (CPITN)
		Age group 35-44	Age group 35-44 (n = 199 individuals/1074 sextants)
		0 – 1	0 – 1 = 12.3% (n = 132 sextants)
		2 – 3	2 – 3 = 56.4% (n = 606 sextants)

Table I - Continued...

Authors, Country, Study design	Sample (n and characteristics)	Outcome variable/ Indices used	Results
Stabholz et al. [27], Israel, cross-sectional study.	412 adults ≥ 35 years of age living in settlements in Israel.	4	4 = 31.3% (n = 336 sextants)
		Age group 45-54	Age group 45-54 (n = 137 individuals/822 sextants)
		0 – 1	0 – 1 = 14.6% (n = 120 sextants)
		2 – 3	2 – 3 = 54.4% (n = 447 sextants)
		4	4 = 31% (n = 255 sextants)
		Age group 55+	Age group 55+ (n = 96 individuals/576 sextants)
		0 – 1	0 – 1 = 8.2% (n = 47 sextants)
		2 – 3	2 – 3 = 48.4% (n = 279 sextants)
		4	4 = 43.4% (n = 250 sextants)
Zaheer et al. [28], Greece, cross-sectional study.	156 refugees ≥ 18 years of age living in settlements in Greece.	Self-reported problems with mouth	Self-reported problems with mouth (n = 156)
		Pain	Pain = 48.3% (n = 72)
		Sensitivity	Sensitivity = 12.8% (n = 19)
		Bleeding gums	Bleeding gums = 17.4% (n = 26)
		Appearance of teeth	Appearance of teeth = 18.8% (n = 28)
		Missing teeth	Missing teeth = 21.5% (n = 32)
		Cavities	Cavities = 31.5% (n = 47)
		No problems	No problems = 12.8% (n = 19)
		Perceived oral health	Perceived oral health (n = 150)
		Poor	Poor = 34.7% (n = 52)
		Fair	Fair = 41.3% (n = 62)
		Good	Good = 14.0% (n = 21)
		Very good	Very good = 4.0% (n = 6)
		'I don't know'	'I don't know' = 6.0% (n = 9)
Westaway et al. [29], South Africa, cross-sectional study.	294 black individuals ≥ 12 years of age living in peri-urban informal settlement in South Africa.	Toothache experience	Toothache experience (n = 294)
		Yes	Yes = 49% (n = 144)
		No	No = 51% (n = 150)
		Current oral health problem	Current oral health problem (n = 294)
		Yes	Yes = 40% (n = 116)
		No	No = 60% (n = 178)
		Oral Health Status	Oral health status (n = 289)
		Excellent	Excellent = 3% (n = 8)
		Good	Good = 56% (n = 163)
		Fair	Fair = 29% (n = 84)
		Poor	Poor = 12% (n = 34)

Among children living in a settlement in South Africa, the prevalence of dental caries was 39%, with a mean dmft of 1.58 [21]. Another study conducted in a similar setting reported that 81.5% of children had caries experience, with a mean DMFT of 4 (range: 1-17) [23]. In Tibetan children living in a settlement in India, 84% had caries experience in the mixed dentition and 77.3% in

the permanent dentition. The mean DMFT was 0.92 (± 1.06), and the mean dmft was 3.54 (± 4.11) in the mixed dentition; the mean DMFT in the permanent dentition was 2.82 (± 2.44) [22].

Among adolescents living in rural settlements in Brazil, 93.3% had caries experience, and the mean DMFT was 5.5 [24,25]. Among Brazilian

adults residing in a rural settlement, 74.3% had untreated decayed teeth, 38.8% had DMFT greater than 4, only 8.6% had no tooth loss due to caries, and 23.5% had restored teeth [26].

Periodontal status

Four studies evaluated periodontal conditions [23-25,27] using the Community Periodontal Index (CPI) and the Community Periodontal Index of Treatment Needs (CPITN), which classify periodontal status into five categories: healthy, gingival bleeding, dental calculus, periodontal pockets of 4-5 mm, and periodontal pockets ≥ 6 mm. Additional measures included gingival inflammation and biofilm accumulation.

Among children living in a settlement in South Africa, 82.8% presented gingival inflammation [23]. Among Brazilian adolescents residing in a rural settlement, 28.8% had gingival bleeding (CPI = 1), and 7.8% had dental calculus (CPI = 2) [24]. Similar findings were reported in another study involving Brazilian adolescents, with corresponding rates of 24.6% and 6.7%, respectively [25].

In adults living in settlements in Israel, 31.3% of sextants in the 35-44-year age group had periodontal pockets ≥ 6 mm (CPITN = 4); the prevalence was 31% in the 45-54-year group and 43.4% among individuals aged over 55 years. In the same population, the proportion of sextants classified as healthy (index 0) or presenting gingivitis (index 1) was 12.3%, 14.6%, and 8.2% across the respective age groups [27].

Other outcomes

Regarding self-rated oral health, most adolescents residing in a rural settlement in Brazil reported satisfaction with their dental appearance (55.8%), no difficulty chewing (87.1%), no avoidance of smiling (80.4%), and rated their gingival health as "good" (62.6%) [25]. However, another study conducted among adolescents in a similar context reported that 86.6% had self-reported dental treatment needs [24]. Among adults living in a rural settlement in Brazil, 70.5% reported negative self-rated oral health, and 86.6% reported dental treatment needs [26].

Among adult refugees residing in a settlement in Greece, self-reported oral problems included pain (48.3%), missing teeth (21.5%), and cavities (31.5%). The predominant self-rated oral health categories were "fair" (41.3%) and "poor" (34.7%) [28]. In an

informal peri-urban settlement in South Africa, 49% of participants reported dental pain [29]. Among adults living in a rural settlement in Brazil, 59.8% reported no current dental pain [26].

Risk of bias assessment

The risk of bias assessment revealed methodological variability across the included studies. Most studies adequately described the study populations and settings and employed recognized diagnostic criteria for oral health outcomes. However, recurrent limitations were observed in sampling strategies, identification and control of potential confounding factors, and management or reporting of response rates.

Bhayat et al. [21], Bhatt and Gaur [22], Leão et al. [24], Moimaz et al. [25], and Westaway et al. [29] were judged to be at risk of bias due to failure to identify or address potential confounding factors. Brijlal and Gordon [23], in addition to not addressing confounding factors, did not clearly report the use of objective and standardized criteria for measuring oral conditions, and the presentation of results raised concerns regarding measurement validity and reliability. Stabholz et al. [27] did not clearly define the criteria used to include individuals in the sample, and the grouping of periodontal scores limited interpretability, resulting in additional risk of bias. A detailed appraisal of each study according to the JBI checklist is presented in Table II. Despite these methodological limitations, all studies were retained for qualitative and quantitative synthesis.

Meta-analyses

Three studies [22-24] were included in the meta-analysis of caries experience (DMFT/dmft ≥ 1). The pooled prevalence of caries experience was 84.46% (95% CI: 75.09-91.93), with high heterogeneity ($I^2 = 85.15\%$).

Three studies [26,28,29] were included in the meta-analysis of dental pain. The pooled prevalence of dental pain was 44.74% (95% CI: 38.84-50.72), with moderate heterogeneity ($I^2 = 69.26\%$).

Three studies [26,28,29] were also included in the meta-analysis of negative self-rated oral health. The pooled prevalence of negative self-perception was 62.81% (95% CI: 41.44-81.84), with very high heterogeneity ($I^2 = 97.62\%$). The forest plots are presented in Figure 3.

Table II - Appraisal of risk of bias of studies included in systematic review using JBI protocol [18]

Reference and publication year	Were the inclusion criteria for the sample clearly defined?	Were the study subjects and setting described in detail?	Was the exposure measured in a valid and reliable way?	Were objective, standard criteria used for measurement of the condition?	Were confounding factors identified?	Were strategies for dealing with confounders stated?	Were the outcomes measured in a valid and reliable way?	Was appropriate statistical analysis used?
Bhayat et al., 2024 [21]	Yes	Yes	Yes	Yes	No	Not applicable	Yes	Yes
Bhatt et al., 2019 [22]	Yes	Yes	Yes	Yes	No	Not applicable	Yes	Yes
Brijlal and Gordon, 2005 [23]	Yes	Yes	Yes	No	No	Not applicable	Unclear	No
Leão et al., 2015 [24]	Yes	Yes	Yes	Yes	No	Not applicable	Yes	Yes
Moimaz et al., 2018 [25]	Yes	Yes	Yes	Yes	No	Not applicable	Yes	Yes
Moura et al., 2014 [26]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stabholz et al., 1998 [27]	No	Yes	Yes	Yes	Yes	Yes	No	Yes
Zaheer et al., 2022 [28]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Westaway et al., 1999 [29]	Yes	Yes	Yes	Yes	No	Not applicable	Yes	Yes

No = high risk of bias; Unclear = undetermined risk of bias; Yes = low risk of bias.

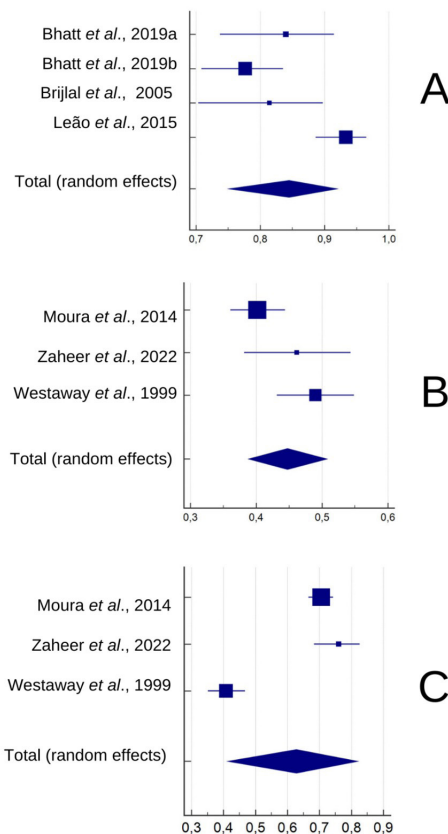


Figure 3 - (A) Meta-analysis of the prevalence of dental caries; (B) prevalence of dental pain; (C) and prevalence of negative perception of oral health.

Evaluation of evidence certainty

The three meta-analyses exhibited very serious concerns regarding risk of bias, inconsistency, indirectness, and imprecision. The certainty of evidence was very low for each meta-analysis (Annex A).

DISCUSSION

A global decline in dental caries has been observed over recent decades, however, this reduction has occurred alongside a marked polarization of the disease, with a disproportionate burden among socioeconomically disadvantaged groups. Structural determinants such as precarious housing conditions, limited access to health services, restricted availability of preventive technologies, and broader social inequities play a central role in shaping oral health outcomes [30-33]. The prevalence of dental caries among Tibetan children living in a settlement in India was higher than that reported for Tibetan children in other contexts [22]. Similarly, the prevalence of caries among children up to six years of age residing in a settlement in South Africa exceeded 80% in a study [23]. Among adolescents living in rural settlements in Brazil, the mean DMFT values were higher than national averages for the same age group [24,25]. Together, these findings suggest that residence in settlement contexts is associated with both a higher occurrence and greater severity of dental caries, particularly among younger populations.

Water fluoridation remains one of the most effective population-based strategies for the prevention of dental caries, particularly in settings where access to individual dental care is limited [34,35]. Although exposure to fluoridated water was not directly assessed in the included studies, several reported precarious living conditions, including inadequate access to safe drinking water and sanitation infrastructure. This context supports the hypothesis that residents of settlements may have limited exposure to fluoridated public water supplies, potentially contributing to an increased risk of dental caries.

Periodontal conditions also appear to follow a similar social gradient, as the findings indicate substantial periodontal treatment needs, particularly in older age groups. The prevalence of gingivitis and periodontitis is consistently higher among populations with poorer

socioeconomic indicators [36,37]. Brijlal and Gordon [23] reported a high frequency of gingival inflammation among children living in settlements in South Africa, affecting nearly 90% of the study population. In contrast, studies involving Brazilian adolescents residing in rural settlements found lower gingival bleeding indices compared to national averages and a higher proportion of individuals without periodontal alterations. However, the prevalence of dental calculus was higher than national estimates [24,25]. Among adults aged 35 to 54 years living in settlements in Israel, deep periodontal pockets affected approximately one third of evaluated sextants, increasing to 43% among individuals aged over 55 years [27].

The high prevalence of restorative, endodontic, extraction, and prosthetic treatment needs observed in settlement populations reflects both the burden of untreated oral diseases and potential barriers to accessing oral health services. Limited utilization of dental services was evident in several studies: approximately 61% of Tibetan children residing in settlements in India and 63% of adults living in informal settlements in South Africa had never visited a dentist [22,29].

The reasons for residence in settlements varied across studies and included agrarian reform processes [24-26], forced or voluntary migration [22,28], alternative economic production arrangements [27], and extreme poverty [21,23,29]. Despite differing sociopolitical origins, these populations shared common territorial and environmental characteristics, including precarious housing structures (tin, wood, plastic sheeting, containers, or abandoned buildings) [23,28], inadequate access to potable water, sanitation, waste management, stable employment, food security, and health services [23], geographic isolation with barriers to healthcare access [21,24,25], and dependence on philanthropic or non-governmental organizations [23,28]. These shared contextual vulnerabilities justified their grouping in the present review.

It is important to recognize that territorial context alone does not determine the health-disease process [38]. Rather, the structural, socioeconomic, and political conditions that shape life within these territories likely interact to influence oral health outcomes. The circumstances leading individuals to reside in

settlements may be intrinsically linked to broader social determinants of health and should be more comprehensively investigated in future research.

In this systematic review, important limitations should be acknowledged. The risk of bias appraisal identified issues across several criteria, particularly related to sampling procedures, clarity of inclusion criteria, measurement reporting, and response rate management. Nevertheless, all eligible studies were retained, as the identified limitations were specific and did not preclude inclusion in the qualitative or quantitative synthesis. However, the overall body of evidence remains limited by the small number of available cross-sectional studies and their heterogeneity, especially regarding age distribution, dentition assessed, diagnostic indices employed, and outcome definitions.

This review also presents strengths. The comprehensive search strategy across multiple international databases, adherence to PRISMA 2020 reporting standards, and methodological guidance from JBI enhance transparency and reproducibility. The application of a standardized risk of bias assessment tool and the performance of meta-analyses for comparable outcomes further strengthen the analytical rigor of the study.

From a public health perspective, these findings reinforce the marked vulnerability of populations living in settlements and emphasize the need for targeted oral health policies that expand access to preventive measures, fluoridation strategies, early diagnosis, and comprehensive dental care. Future research should prioritize longitudinal designs, probabilistic sampling methods, standardized diagnostic criteria, and improved reporting of response rates to strengthen the evidence base and support more precise public health interventions for these highly vulnerable populations.

CONCLUSION

Populations living in settlement contexts demonstrated a high prevalence of dental caries experience, dental pain, and negative self-rated oral health, reflecting a substantial burden of untreated oral conditions. Although causal inferences cannot be established, precarious sanitary conditions and limited access to oral health services appear to be

important contextual factors associated with these outcomes.

These findings highlight persistent inequalities in oral health and reinforce the need for public policies aimed at expanding access to preventive and comprehensive dental care for socially vulnerable populations. Further well-designed studies are necessary to strengthen the evidence and better clarify the relationship between settlement living conditions and oral health status.

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Not applicable.

Data availability

The data supporting this study are available as an annex. The master's dissertation from which this study originated is included in the repository of the Integrated Dental Sciences Program of the Universidade de Cuiabá, Brazil.

Annex A. Assessment of the certainty of evidence for the three meta-analyses

Author's Contributions

SBR, LERV, LGA: Conceptualization. SBR, LERV, LGA, JGML, APSG: Methodology. SBR, LERV, LGA, JGML, APSG: Software. SBR, LERV, LGA, JGML, APSG: Validation. SBR, LERV, LGA, JGML, APSG: Formal Analysis. SBR, LERV, LGA, JGML, APSG: Investigation. LERV, LGA: Resources. SBR, LERV, LGA, JGML, APSG: Data Curation. SBR, JGML, APSG: Writing – Original Draft Preparation. LERV, LGA: Writing – Review & Editing. SBR, LERV, LGA, JGML, APSG: Visualization. LERV, LGA: Supervision. SBR, LERV, LGA: Project Administration. LERV, LGA: Funding Acquisition.

Conflict of Interest

No conflicts of interest declared concerning the publication of this article.

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Regulatory Statement

Not applicable.

REFERENCES

1. Ely HC, Abegg C, Celeste RK, Pattussi MP. Impact of oral health teams of the Family Health Strategy on the oral health of adolescents in the south of Brazil. *Cien Saude Colet*. 2016;21(5):1607-16. <https://doi.org/10.1590/1413-81232015215.07822015>. PMID:27166908.
2. Singh A, Peres MA, Watt RG. The relationship between income and oral health: a critical review. *J Dent Res*. 2019;98(8):853-60. <https://doi.org/10.1177/0022034519849557>. PMID:31091113.
3. Bergamasco S, Blanc-Pamard C, Chonchol M-E. Por um atlas dos assentamentos brasileiros: espaços de pesquisa. Rio de Janeiro: DL/Brasil; 1997. p. 149-75. (vol. 3).
4. Alves JP Fo, Ribeiro H. Environmental health in the countryside: the case of sustainable development projects in rural settlements in the State of São Paulo. *Saude Soc*. 2014;23:448-66. <https://doi.org/10.1590/S0104-12902014000200008>.
5. Ferreira DC, Luz SL, Buss DF. Evaluation of simple diffusion chlorinators for decontamination of wells in a rural settlement in Amazonia, Brazil. *Cien Saude Colet*. 2016;21(3):767-76. <https://doi.org/10.1590/1413-81232015213.23562015>. PMID:26960089.
6. Neves-Silva P, Lopes JA, Heller L. The right to water: impact on the quality of rural workers in a settlement of the Landless Workers Movement, Brazil. *PLoS One*. 2020;15(7):e0236281. <https://doi.org/10.1371/journal.pone.0236281>. PMID:32687522.
7. Fontoura EE Jr, Souza KR, Renovato RD, Sales C. Health and work relations in a rural settlement of the MST in the Brazil-Paraguay border region. *Trab Educ Saúde*. 2012;9:379-97.
8. Santos JC, Hennington EA. Nobody gives orders here: the meanings of work and health for settlers from the Landless Rural Workers' Movement. *Cad Saude Publica*. 2013;29(8):1595-604. <https://doi.org/10.1590/S0102-311X2013001200012>. PMID:24005925.
9. Carneiro FF, Tambellini AT, Silva JA, Haddad JP, Búrigo AC, Sá WR, et al. Health of families from the Landless Workers' Movement and temporary rural workers, Brazil, 2005. *Rev Saude Publica*. 2008;42(4):757-63. <https://doi.org/10.1590/S0034-89102008000400024>. PMID:18622458.
10. Oliveira EM, Felipe EA, Santana HS, Rocha IH, Magnabosco P, Figueiredo MAC. Socio-historical determinants of care in the Family Health Strategy: a user perspective in the rural area. *Saude Soc*. 2015;24(3):901-13. <https://doi.org/10.1590/S0104-12902015132279>.
11. United Nations Human Settlements Programme. World cities report 2022: envisaging the future of cities. Nairobi: UN-Habitat; 2022.
12. United Nations High Commissioner for Refugees. UNHCR master glossary of terms. Geneva: UNHCR; 2023.
13. Bernabe E, Marcenes W, Hernandez CR, Bailey J, Abreu LG, Alipour V, et al. Global, regional, and national levels and trends in burden of oral conditions from 1990 to 2017: a systematic analysis for the Global Burden of Disease 2017 study. *J Dent Res*. 2020;99(4):362-73. PMID:32122215.
14. Hobdell MH, Oliveira ER, Bautista R, Myburgh NG, Lalloo R, Narendran S, et al. Oral diseases and socio-economic status (SES). *Br Dent J*. 2003;194(2):91-6. <https://doi.org/10.1038/sj.bdj.4809882>. PMID:12577077.
15. Pascoal ALB, Paulino MR, Oliveira AGRC, Carreiro AFP, Mestriner W, Calderon PS. A randomized clinical trial of a simplified technique for complete denture fabrication: patient perceptions, masticatory efficiency, temporomandibular disorders and quality of dentures. *Braz Dent Sci*. 2024;27(3):e4353. <https://doi.org/10.4322/bds.2024.e4353>.
16. Marmot M, Bell R. Social determinants and dental health. *Adv Dent Res*. 2011;23(2):201-6. <https://doi.org/10.1177/0022034511402079>. PMID:21490231.
17. Setijanto D, Alkadasi BA, Nurrobbi LAW, Dewi FL, Firmansyah FF. Caregiver perception of children's dental caries and experience of accessing dental health services for their children: Caregiver Perception of Children's Dental Caries and Accessing Dental Health Services. *Braz Dent Sci*. 2023;26(2):e3749. <https://doi.org/10.4322/bds.2023.e3749>.
18. Munn Z, Moola S, Lisy K, Riitano D, Tufanaru C. Systematic reviews of prevalence and incidence. In: Aromataris E, Munn Z, editors. *JBI manual for evidence synthesis*. Adelaide: JBI; 2020.
19. 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. *Rev Panam Salud Publica*. 2022;46:e112. PMID:36601438.
20. Evidence Prime. GRADEpro GDT: GRADEpro Guideline Development Tool [Internet]. McMaster University; 2023 [cited 2025 Nov 02]. Available from <https://www.gradepr.org/>
21. Bhayat A, Madiba TK, Beeforth M, Nkambule NR. The oral health status and anthropometric measurements of children at early childhood development centers in an informal settlement in Pretoria, South Africa. *Int J Clin Pediatr Dent*. 2024;17(8):903-6. <https://doi.org/10.5005/jp-journals-10005-2868>. PMID:39372351.
22. Bhatt S, Gaur A. Dental caries experience and utilization of Oral Health services among Tibetan refugee-background children in Paonta sahib, Himachal Pradesh, India. *J Immigr Minor Health*. 2019;21(3):461-5. <https://doi.org/10.1007/s10903-018-0769-7>. PMID:29869194.
23. Brijlal P, Gordon N. Mapping an appropriate health promotion approach for crèches in an informal settlement. *Int J Dent Hyg*. 2005;3(1):31-6. <https://doi.org/10.1111/j.1601-5037.2004.00116.x>. PMID:16451375.
24. Leão MM, Garbin CA, Moimaz SA, Rovida TA. Oral health and quality of life: an epidemiological survey of adolescents from settlement in Pontal do Paranapanema/SP, Brazil. *Cien Saude Colet*. 2015;20(11):3365-74. <https://doi.org/10.1590/1413-812320152011.00632015>. PMID:26602714.
25. Moimaz AS, Leão MM, Santos LFP, Saliba NA, Saliba TA. Estilo de vida e saúde oral de adolescentes brasileiros residentes em assentamentos rurais. *Rev Adolesc Saude*. 2018;15:81-91.
26. Moura C, Gusmão ES, Santillo PM, Soares RS, Cimões R. Self-rated oral health and associated factors among adults in rural settlements, Pernambuco State, Brazil. *Cad Saude Publica*. 2014;30(3):611-22. <https://doi.org/10.1590/0102-311X00117012>. PMID:24714950.
27. Stabholz A, Mann J, Berkey D. Periodontal health and the role of the dental hygienist. *Int Dent J*. 1998;48(1):50-5. <https://doi.org/10.1111/j.1875-595X.1998.tb00694.x>. PMID:9779084.
28. Zaheer K, Wanyonyi K, Williams DM. Oral health-related quality of life of refugees in settlements in Greece. *Int Dent J*. 2022;72(5):706-15. <https://doi.org/10.1016/j.identj.2022.04.004>. PMID:35570016.
29. Westaway M, Viljoen E, Rudolph MJ. Utilization of oral health services, oral health needs and oral health status in a peri-urban informal settlement. *SADJ*. 1999;54(4):149-52. PMID:10518916.
30. Kitamura ES, Leite IC. Correlation between human development index and dental caries in a sample of municipalities in Minas Gerais: implications for the inclusion of dentistry in the family health strategy. *Rev. APS*. 2009;12:140-9.

31. Baldani MH, Vasconcelos AG, Antunes JL. Association of the DMFT index with socioeconomic and dental services indicators in the state of Paraná, Brazil. *Cad Saude Publica*. 2004;20(1):143-52. <https://doi.org/10.1590/S0102-311X2004000100030>. PMID:15029315.
32. Tassinari WS, de León AP, Werneck GL, Faerstein E, Lopes CS, Chor D, et al. Socioeconomic context and perceived oral health in an adult population in Rio de Janeiro, Brazil: a multilevel analysis. *Cad Saude Publica*. 2007;23(1):127-36. <https://doi.org/10.1590/S0102-311X2007000100014>. PMID:17187111.
33. Bernabé E, Sheiham A, Sabbah W. Income, income inequality, dental caries and dental care levels: an ecological study in rich countries. *Caries Res*. 2009;43(4):294-301. <https://doi.org/10.1159/000217862>. PMID:19439951.
34. García-Pérez A, Irigoyen-Camacho ME, Borges-Yáñez A. Fluorosis and dental caries in Mexican schoolchildren residing in areas with different water fluoride concentrations and receiving fluoridated salt. *Caries Res*. 2013;47(4):299-308. <https://doi.org/10.1159/000346616>. PMID:23406606.
35. James P, Harding M, Beecher T, Browne D, Cronin M, Guiney H, et al. Impact of reducing water fluoride on dental caries and fluorosis. *J Dent Res*. 2021;100(5):507-14. <https://doi.org/10.1177/0022034520978777>. PMID:33345672.
36. Neves AM, Passos IA, Oliveira AF. Study of the prevalence and severity of gingivitis in a population with low socioeconomic status. *Odontol Clin Cient*. 2010;9:65-71.
37. Vettore MV, Marques RAA, Peres MA. Social inequalities and periodontal disease: multilevel approach in SB Brasil 2010 survey. *Rev Saude Publica*. 2013;47(Suppl 3):29-39. <https://doi.org/10.1590/S0034-8910.2013047004422>. PMID:24626579.
38. Moreira RS, Nico LS, Tomita NE. The relation between space and collective oral health: for a georeferenced epidemiology. *Cien Saude Colet*. 2007;12(1):275-84. <https://doi.org/10.1590/S1413-81232007000100031>. PMID:17680079.

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Annex A. Assessment of the certainty of evidence for the three meta-analyses

N° of studies	Study design	Certainty assessment			Other considerations	N° of patients Individuals in settlements	Effect		Certainty	Importance
		Risk of bias	Inconsistency	Indirectness			Imprecision	Relative (95% CI)		
Dental caries										
4	non-randomised studies	very serious ^a	very serious ^b	very serious ^c	very serious ^d	publication bias strongly suspected all plausible residual confounding would reduce the demonstrated effect ^e	427/504 (84.7%)	not estimable	⊕○○○ Very low ^{a,b,c,d,e}	
Dental pain										
3	non-randomised studies	very serious ^a	very serious ^b	very serious ^c	very serious ^d	publication bias strongly suspected all plausible residual confounding would reduce the demonstrated effect ^e	439/105 (43.7%)	not estimable	⊕○○○ Very low ^{a,b,c,d,e}	
Negative perception of oral health										
3	non-randomised studies	very serious ^a	very serious ^b	very serious ^c	very serious ^d	publication bias strongly suspected all plausible residual confounding would reduce the demonstrated effect ^e	625/996 (62.8%)	not estimable	⊕○○○ Very low ^{a,b,c,d,e}	

CI: confidence interval. Explanations: ^aRisk of bias. ^bStatistical heterogeneity is high. ^cDifferent settlements and countries assessed. ^dLarge confidence interval. ^ePossibility of non-publication of results.