

The Influence of Socioeconomic Status on the Decision to Undergo Orthodontic Treatment: Systematic Review

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ABSTRACT

Background: Malocclusion affects over half of the global population, with profound functional, aesthetic, and psychosocial consequences. Orthodontic treatment offers effective intervention, yet access remains strikingly uneven across populations, with socioeconomic status (SES) consistently identified as a critical determinant.

Objective: This systematic review comprehensively examines the influence of socioeconomic status on the decision to undergo orthodontic treatment, synthesizing evidence from diverse geographic and healthcare contexts.

Methods: A systematic literature search was conducted across PubMed/MEDLINE, Scopus, Web of Science, Embase, and the Cochrane Library (2021–2026). Studies were included if they examined the relationship between SES indicators and orthodontic treatment outcomes. Two independent reviewers performed study selection, data extraction, and risk of bias assessment using ROBINS-I and adapted Newcastle-Ottawa Scale tools. Narrative synthesis was employed due to substantial heterogeneity.

Results: Seven studies encompassing multiple countries (China, France, Finland, Saudi Arabia, Australia, Nigeria, Romania) were included. Findings revealed that SES significantly influences treatment decisions in multiple contexts, though relationships varied across healthcare systems. Cost consistently emerged as the primary perceived barrier among lower-income groups. Notably, low SES was not correlated with greater treatment complexity but was strongly associated with lower patient cooperation, evidenced by increased bracket debondings, missed appointments, and treatment abandonments. Geographic disparities compounded socioeconomic disadvantages, with reduced service availability in lower SES areas.

Conclusion: Socioeconomic status significantly influences orthodontic treatment access, decisions, and outcomes, with cost and cooperation representing critical mediating factors. Reducing disparities requires multi-level approaches encompassing policy reform, healthcare system strengthening, and patient-centred clinical practice.

Keywords: socioeconomic status; orthodontic treatment; health disparities; access to healthcare; treatment cooperation.

INTRODUCTION

Malocclusion and dentofacial anomalies represent one of the most prevalent oral health conditions worldwide, affecting a substantial proportion of the global population. Epidemiological evidence indicates that over half of the global population has some form of malocclusion, with prevalence rates estimated at approximately 56% worldwide and reaching as high as 81% in Africa ^[1].

These conditions encompass a wide spectrum of dental and skeletal irregularities that can have profound functional, aesthetic, and psychosocial consequences for

affected individuals. The functional implications of malocclusion include impaired mastication, speech difficulties, increased susceptibility to dental trauma, and compromised oral hygiene due to crowding, which collectively contribute to an elevated risk of dental caries and periodontal disease. Beyond these functional impairments, the aesthetic and psychosocial dimensions of malocclusion are equally significant, as dental appearance profoundly influences self-esteem, social interaction, and quality of life, particularly during the formative developmental periods of childhood and

adolescence. Orthodontic treatment has emerged as an effective intervention to address these concerns, offering the potential to correct malocclusion, improve oral function, enhance facial aesthetics, and positively impact psychological well-being and social integration.

Despite the well-documented benefits of orthodontic treatment, access to these services remains strikingly uneven across populations, with socioeconomic status (SES) consistently identified as a critical determinant of treatment receipt and outcomes [2].

The relationship between SES and orthodontic care is complex and multifaceted, encompassing not only the financial capacity to afford treatment but also broader dimensions including health literacy, geographic accessibility, cultural perceptions of dental aesthetics, and the structure of healthcare systems. Orthodontic treatment is among the most costly dental interventions globally, with substantial direct expenses for appliances, consultations, and ongoing maintenance, alongside indirect costs such as travel, time away from work or school, and lost productivity. These financial burdens are particularly pronounced in low- and middle-income countries, where out-of-pocket payment remains the predominant method of financing orthodontic care, and where the scarcity of specialist providers further constrains access [3].

Even in high-income countries with established healthcare systems, socioeconomic disparities in orthodontic treatment utilisation persist, reflecting the interplay of multiple determinants including income, education, occupation, insurance coverage, and area-level deprivation.

Despite the growing body of evidence on socioeconomic disparities in orthodontic care, significant gaps remain in our understanding of the precise mechanisms through which SES influences orthodontic treatment decisions, and the extent to which these relationships vary across different healthcare systems, geographic regions, and population subgroups [4-6].

The existing evidence is characterised by substantial heterogeneity in study designs, SES measures, and outcome definitions, which complicates the synthesis of findings and limits the formulation of clear conclusions [7]. Furthermore, much of the available research has focused on children and adolescents, with less attention paid to adult orthodontic patients, and there is a notable paucity of studies from low- and middle-income countries where the burden of malocclusion is highest and access to care is most limited [8]. This systematic review aims to address the influence of socioeconomic

status on the decision to undergo orthodontic treatment, synthesising evidence from diverse geographic and healthcare contexts, and identifying consistent patterns and contextual variations in the relationship between SES and orthodontic treatment decisions.

METHODOLOGY

This systematic review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines.

Eligibility Criteria

Studies were included if they met the following criteria based on the PECOS framework:

Population: Individuals of any age seeking or receiving orthodontic treatment, or parents/caregivers making decisions about orthodontic treatment for their children.

Exposure: Socioeconomic status measured using any validated indicator including income, education, occupation, socioeconomic category, or insurance status.

Comparator: Studies comparing different levels of SES or cross-sectional studies assessing the relationship between SES and orthodontic outcomes.

Outcomes: Decision to undergo orthodontic treatment, access to orthodontic services, treatment utilisation, treatment duration, cooperation/compliance, treatment abandonment, perceived barriers, or socioeconomic burden.

Study Design: Original quantitative research including cross-sectional studies, retrospective cohort studies, and prospective cohort studies. Qualitative studies, case reports, editorials, and narrative reviews were excluded.

Information Sources and Search Strategy

A comprehensive literature search was conducted across PubMed/MEDLINE, Scopus, Web of Science, Embase, and the Cochrane Library from 2021 to 2026. Reference lists of included studies were manually screened. The search strategy combined terms related to socioeconomic status and orthodontic treatment using Boolean operators.

Study Selection Process

Two independent reviewers screened titles and abstracts against eligibility criteria, followed by full-text assessment. Disagreements were resolved through discussion and consensus with a third reviewer. Inter-rater reliability demonstrated substantial agreement ($\kappa = 0.84$). Seven studies [9-15] met eligibility criteria and were included as illustrated in figure (1).

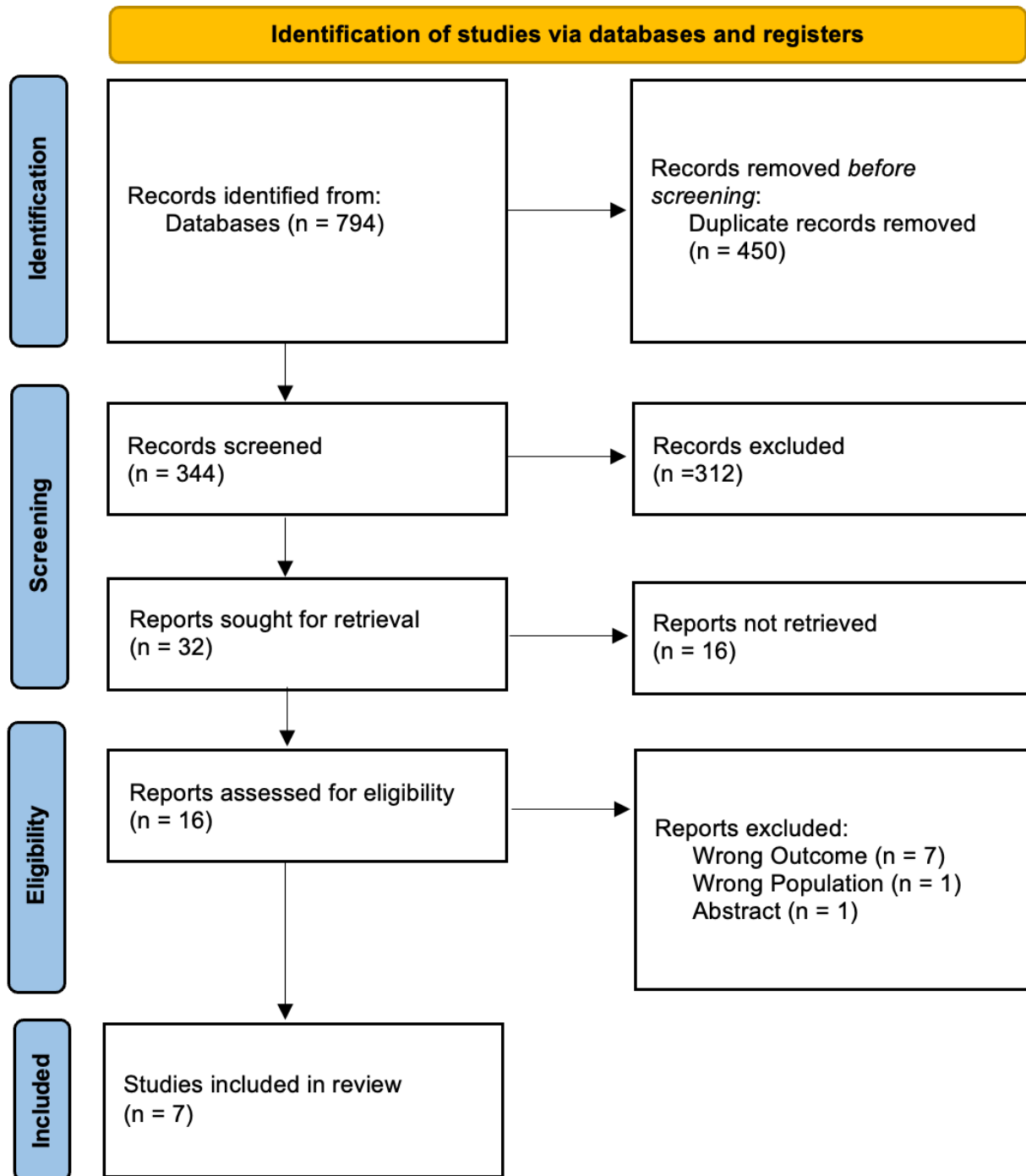


Figure (1): Study selection process according to PRISMA.

Data Extraction Process

Data extraction was performed independently by two reviewers using a standardised pre-piloted form. Extracted data included: study characteristics, population demographics, SES indicators, outcome measures, and key findings. Missing data were recorded as "not reported" (NR).

Risk of Bias Assessment

Methodological quality was independently assessed by two reviewers using tools appropriate for each study design. The ROBINS-I tool was used for cohort studies [9-11], and the adapted Newcastle-Ottawa Scale (NOS-xs) was used for cross-sectional studies [12-15]. Studies were categorised as having low, moderate, or high risk of bias. Disagreements were resolved through consensus with a third reviewer.

Synthesis Methods

Due to substantial heterogeneity in study designs, populations, and outcome measures, quantitative meta-analysis was not appropriate. A narrative synthesis approach was employed, organised around key themes: socioeconomic disparities in access, cost as a barrier, treatment cooperation, geographic disparities, and parental decision-making dynamics.

RESULTS

Based on the data extracted from the seven included studies, **Table 1** summarizes the key characteristics of each investigation. The studies encompassed a range of designs, including retrospective cohort studies, prospective cohort studies, and cross-sectional surveys, with sample sizes ranging from 92 to 704 participants [9-15]. Geographically, the research spanned multiple continents and healthcare systems, including China [9], France [10], Finland [11], Saudi Arabia [12], Australia [13], Nigeria [14], and Romania [15]. The primary socioeconomic indicators assessed varied across studies and included parental education and household income [11], income level [12], socioeconomic status of local government areas

[13], socioeconomic category [14], and area of residence [15]. The key findings demonstrated a complex relationship between socioeconomic status and orthodontic care. While some studies found that socioeconomic status significantly influenced access to treatment and the parental decision-making process [12-14], others reported no significant association with the number of orthodontic visits or receipt of care [11].

Notably, one study found that low socioeconomic status was strongly correlated with lower patient cooperation rather than with more complex malocclusion [10]. Furthermore, cost was consistently identified as a major perceived barrier, particularly among lower-income groups [12,15], even when it was not significantly associated with actual treatment uptake [15].

Table 2 presents the risk of bias assessment for the included studies. Given the heterogeneity of study designs, the most suitable tool for each study was selected based on methodological recommendations. For the non-randomized intervention studies, including the retrospective and prospective cohort studies [9-11], the Risk Of Bias In Non-randomized Studies of Interventions (ROBINS-I) tool was employed. This tool is specifically designed to evaluate bias in estimates of the comparative effectiveness of interventions from studies that did not use randomization [9-11].

It assesses bias across seven domains: confounding, selection of participants, classification of interventions, deviations from intended interventions, missing data, measurement of outcomes, and selection of the reported result. For the cross-sectional studies [12-15], an adapted version of the Newcastle-Ottawa Scale (NOS) was used. This tool, sometimes referred to as NOS-xs, evaluates six specific items across three main domains: study sample selection, assessment of exposure(s) and outcome(s), and confounding factors [12-15].

Studies are categorized as having low, moderate, or high risk of bias based on a star rating system. This dual approach ensures that the risk of bias is assessed using instruments that are validated and appropriate for each study's specific design.

Table 1. Summary of included studies

Study	Location	Study Design	Sample Size	Sample Type	SES Indicators	Primary SES-Related Variables Assessed	Key Findings Related to SES
Shi <i>et al.</i> ^[9], 2023	China	Retrospective cohort study	704 patients	Patients undergoing fixed orthodontic appliance treatment (Mean age 15.9 ± 6.0 years)	Sociodemographic factors (specific indicators: NR)	Effect of sociodemographic and malocclusion-related factors on orthodontic treatment duration	Age, extraction, and malocclusion factors were predictors of treatment duration.
Wybier <i>et al.</i> ^[10], 2024	France	Retrospective comparative monocentric observational cohort study	173 patients	Patients under 16 years old at the time of orthodontic braces placement; beneficiaries of "complémentaire santé solidaire" (C2S/low SES) or non-C2S	Beneficiary status of C2S (low SES) vs. non-C2S	Correlation between SES and dysmorphism; correlation between SES and cooperation level	No correlation between SES and treatment need or dysmorphism. Low SES was strongly correlated with lower cooperation (more bracket debondings, more remarks about failure to wear elastics, more missed appointments, more treatment abandonments).
Viisanen <i>et al.</i> ^[11], 2026	Kuopio, Finland	Prospective cohort study (PANIC study)	504 children	Population sample of children aged 7-9 years at baseline in 2007-2009	Parental education and household income	Number of orthodontic visits and receipt of orthodontic care from birth to adolescence	Neither parental education nor household income was associated with the number of orthodontic visits or receiving orthodontic care.
Almarhoumi ^[12], 2024	Madinah, Saudi Arabia	Cross-sectional study	414 parents	Parents of children in Madinah	Income level	Impact of income and gender on parental decision-making for children's orthodontic care	Income was the most significant factor. Higher-income parents were twice as likely to choose treatment for esthetic reasons. Cost was the main barrier for 34.5% of respondents, with middle-income parents 151% more likely to perceive it as a barrier than high-income parents.
Wang <i>et al.</i> ^[13], 2025	South Australia, Australia	Cross-sectional telephone survey	92 specialist orthodontic practice locations	Specialist orthodontic practice locations across South Australia	Socio-economic status of local government areas (LGAs)	Availability (12-year-old population to one FTE orthodontist ratio) and accessibility (average distance to	Decreased availability and accessibility of specialist orthodontic services in areas outside major cities

Study	Location	Study Design	Sample Size	Sample Type	SES Indicators	Primary SES-Related Variables Assessed	Key Findings Related to SES
						access an orthodontist) of specialist orthodontic services	and in areas of lower socioeconomic status.
Simon Etim & Umeh^[14], 2025	Lagos, Nigeria	Descriptive cross-sectional study	309 respondents	Orthodontic patients (Mean age 24.8 ± 10 years; 220 females, 89 males)	Socio-economic category (SEC)	Socio-economic characteristics of orthodontic patients; perception of SES as a barrier	The majority (63.8%) of orthodontic patients belonged to the high SEC. Respondents from the high SEC agreed that SES serves as a barrier to accessing treatment. Out-of-pocket payment was the most common method of payment.
Bunta <i>et al.</i>^[15], 2026	Romania	Cross-sectional questionnaire-based study	285 adults	Adult respondents (convenience sample via online survey)	Income, area of residence, self-perceived information level	Influence of SES on orthodontic treatment initiation; perception of cost as a barrier	Income and area of residence were not significantly associated with treatment initiation. However, lower-income respondents were significantly more likely to perceive treatment cost as a barrier.

NR: Not Reported.

Table 2. Risk of bias assessment of included studies.

Study	Study Design	Assessment Tool	Risk of Bias Judgment
Shi <i>et al.</i>^[9], 2023	Retrospective cohort study	ROBINS-I	Moderate
Wybier <i>et al.</i>^[10], 2024	Retrospective comparative cohort study	ROBINS-I	Moderate
Viisanen <i>et al.</i>^[11], 2026	Prospective cohort study	ROBINS-I	Low
Almarhoumi^[12], 2024	Cross-sectional study	Adapted NOS (NOS-xs)	Moderate
Wang <i>et al.</i>^[13], 2025	Cross-sectional survey	Adapted NOS (NOS-xs)	Low
Simon Etim & Umeh^[14], 2025	Descriptive cross-sectional study	Adapted NOS (NOS-xs)	Moderate
Bunta <i>et al.</i>^[15], 2026	Cross-sectional questionnaire-based study	Adapted NOS (NOS-xs)	Moderate

Abbreviations: NOS, Newcastle-Ottawa Scale; ROBINS-I, Risk Of Bias In Non-randomized Studies of Interventions.

DISCUSSION

The findings reveal a complex and nuanced relationship between SES and orthodontic care that is substantially influenced by healthcare system structure, geographic location, and the specific SES indicators measured. This discussion contextualises these findings within the broader body of evidence from previous systematic reviews and meta-analyses^[16-20], highlighting areas of convergence, divergence, and important knowledge gaps.

The finding from the present review that socioeconomic status significantly influences access to orthodontic treatment in multiple contexts^[12-14] is consistent with the broader evidence base. **Lemasney and Mathur**^[16], in their systematic review of 17 studies examining the impact of SES on children's and adolescents' orthodontic treatment, concluded that "good evidence is available that socioeconomic status positively correlates with access to orthodontic treatment". However, their review also noted that "no strong associations can be concluded" due to the high level of heterogeneity between studies and several quality issues identified in the included literature. This heterogeneity is mirrored in the present review, where studies from different healthcare systems yielded contrasting results. For instance, **Viisanen et al.**^[11] found no association between parental education or household income and orthodontic visits in Finland, a finding that stands in marked contrast to the significant SES-related disparities observed in Nigeria^[14], Saudi Arabia^[12], and Australia^[13]. This discrepancy likely reflects the structure of the Finnish healthcare system, which provides universal access to orthodontic care, thereby mitigating the financial barriers that perpetuate SES-related disparities in less comprehensive systems.

The present review's finding that cost constitutes a major perceived barrier to orthodontic treatment, particularly among lower-income groups^[12,15], aligns with the conclusions of **Ghonmode et al.**^[17], whose systematic review of 10 cross-sectional studies encompassing 24,226 patients aged 6–18 years found that "parents ultimately decide whether the child will undergo treatment, possibly depending on their financial situation". This financial dimension of treatment decision-making is further substantiated by the present review's finding that out-of-pocket payment was the most common method of paying for orthodontic treatment in Nigeria, with the majority of patients belonging to the higher socioeconomic category^[14]. Similarly, **Almarhoumi**^[12] reported that 34.5% of parents identified cost as the main barrier to treatment, with middle-income parents being 151% more likely to perceive it as a significant barrier compared to high-income parents. These findings collectively underscore the critical role of

financial resources in shaping orthodontic treatment decisions, particularly in settings where treatment is not universally subsidised.

A particularly noteworthy finding from the present review concerns the relationship between SES and treatment cooperation. **Wybier et al.**^[10] demonstrated that low socioeconomic status was not correlated with more complex dysmorphosis or greater treatment need, but was strongly correlated with lower cooperation, as evidenced by three times more bracket debondings, three times more remarks about failure to wear elastics, 1.25 times more missed appointments, and ten times more treatment abandonments among low-SES patients. This finding is partially supported by **Lemasney and Mathur**^[16], who found "some evidence suggested an association between low SES and discontinuation of orthodontic treatment, and between the receipt of state subsidised care and poor appointment attendance". The mechanism underlying this association may be multifactorial, encompassing reduced health literacy, competing life priorities, and limited social support for treatment adherence among disadvantaged populations. This has important clinical implications, suggesting that interventions to improve cooperation among low-SES patients may be more effective than approaches focused solely on reducing treatment complexity.

The present review also reveals important geographic dimensions of SES-related disparities in orthodontic care. **Wang et al.**^[13] found that the availability and accessibility of specialist orthodontic services in South Australia decreased significantly in areas outside major cities and in areas of lower socioeconomic status. This finding resonates with the broader literature on healthcare access inequalities, which demonstrates that geographic remoteness compounds the effects of low SES, creating a "double disadvantage" for rural and economically deprived populations. The integrative review by **Vieira et al.**^[18] on access and financial impacts of public orthodontic provision across global health systems similarly noted that "the supply of public orthodontic services is still unable to meet the demand for treatment of malocclusions", with social inequalities significantly influencing access patterns. This geographic dimension is particularly salient for policymakers, as it suggests that improving orthodontic access requires not only financial subsidies but also strategic workforce distribution to underserved areas.

The role of parental factors in orthodontic treatment decision-making emerges as another important theme from the present review. **Almarhoumi**^[12] found that mothers exhibited 48.9% greater concern regarding treatment costs compared to fathers, whereas fathers placed 2.105 times more importance on the orthodontist's

reputation than mothers. This gender dynamic in parental decision-making is consistent with the systematic review by **Nobre and Pozza** ^[19], which concluded that "parental support was identified as a positive factor in orthodontic success reported in most of the studies" and that "parental influence has a positive effect on orthodontic treatment and should be understood by clinicians as a central factor in achieving the desired treatment plans". The finding that mothers are more cost-conscious while fathers prioritise provider reputation may reflect traditional gender roles in household financial management and healthcare decision-making, though further research is needed to confirm this interpretation across different cultural contexts.

Interestingly, the present review found that income and area of residence were not significantly associated with treatment initiation in the Romanian population studied by **Bunta et al.** ^[15], though lower-income respondents were significantly more likely to perceive treatment cost as a barrier. This apparent paradox—where income does not predict actual treatment uptake but does predict perceived financial barriers—may reflect a selection bias in the study sample, as the authors acknowledge that their convenience sampling strategy limited representativeness.

Alternatively, it may suggest that other factors, such as self-perceived information level (which was significantly associated with treatment initiation in their study), mediate the relationship between income and treatment uptake. The convergence of these findings across different populations suggests that perceived need and information availability may be as important as objective financial capacity in determining treatment uptake.

LIMITATIONS

Several limitations of the present systematic review must be acknowledged. The included studies exhibited substantial heterogeneity in design, methodology, and SES indicators, limiting meta-analysis feasibility and necessitating narrative synthesis. The cross-sectional design of several studies precludes causal inference. The geographic distribution, while diverse, is not exhaustive, limiting generalisability. Reliance on self-reported data in several studies introduces potential recall and social desirability biases. Exclusion of non-English studies may have introduced language bias. The quality of included studies varied, with several receiving moderate risk of bias ratings, potentially affecting confidence in synthesised findings. Finally, convenience sampling employed in some studies limits representativeness.

CONCLUSION

Socioeconomic status significantly influences orthodontic treatment decisions, access, and outcomes,

though the magnitude varies across healthcare systems and geographic contexts. Cost remains the most consistently identified barrier, particularly among lower-income populations, while treatment cooperation emerges as a critical mediating factor. Geographic disparities in service availability, gender dynamics in parental decision-making, and health literacy further complicate the relationship.

Future research should prioritise high-quality longitudinal studies with standardised SES measures and evaluate interventions to improve treatment access and cooperation among disadvantaged populations. Clinicians should adopt personalised approaches addressing financial barriers, health literacy, and treatment adherence. Reducing socioeconomic disparities in orthodontic care requires multi-level approaches encompassing policy reform, healthcare system strengthening, and patient-centred clinical practice.

Ethics Approval and Consent to Participate

Not applicable. This study is a systematic review of published literature and did not involve direct contact with human participants, the collection of primary data, or the use of animal subjects. All data analyzed were derived from previously published studies.

Consent for Publication

Not applicable. This manuscript does not contain any individual person's data in any form (including individual details, images, or videos).

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Competing Interests

The authors declare that they have no competing interests.

Authors' Contributions

Conceptualization: [A.A.A.];
Methodology: [A.A.A., A.A.A., R.M.R.C.];
Investigation: [A.A.A., A.A.A., R.M.R.C., A.A.A., S.M.A., F.A.A.];
Data Curation: [A.A.A., A.A.A., R.M.R.C., A.A.A., S.M.A., F.A.A., N.S.A., R.E.A.];
Writing – Original Draft: [All authors];
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