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Oral health status among migrants in Campinas, São Paulo: A population-based study

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Abstract

Migration is a social and demographic phenomenon that influences health by reshaping support networks, access to services, and preventive practices. In Brazil, despite the historical relevance of internal migration, there is a lack of population-based studies addressing its impact on oral health. This study aimed to analyze oral health conditions among migrants aged 10 years and older living in Campinas, São Paulo, with comparisons by sex. A cross-sectional population-based survey was conducted using data from the 2014 to 2015 Campinas Health Survey, which employed a probabilistic two-stage cluster sampling design. The final sample comprised 3,019 individuals. Outcomes included dental loss (partial or total), non-use of prostheses, self-rated poor oral health, reasons for consultations, access to urgent care, and psychosocial indicators, such as embarrassment when smiling and difficulty speaking. Associations between migration status and oral health outcomes were estimated using Rao-Scott chi-square tests and Poisson regression with robust variance, adjusting for age, education, race/skin color, and region of origin, stratified by sex. Migrants had poorer oral health than non-migrants, particularly among men. Male migrants had a higher prevalence of tooth loss, poor self-rated oral health, urgent dental visits, difficulty obtaining urgent care, and negative evaluations of services. They also reported greater difficulty speaking and embarrassment when smiling. No significant associations were found for women after adjustment for confounding factors. Nonetheless, the study provides novel evidence that internal migration in Brazil is associated with poorer oral health outcomes, with notable disadvantages for men. These findings highlight the need for policies that address the specific vulnerabilities of migrant populations in accessing and maintaining oral health care.

Keywords: Oral health; Migrants; Sex differences; Health services accessibility; Health surveys; Self-assessment

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1. Introduction

Migration is a social and demographic phenomenon involving the movement of people across regions in search of better living conditions, employment opportunities, and safety, or to escape adverse situations, such as conflicts and natural disasters (Dahlan *et al.*, 2019; Dao *et al.*, 2021; Pabbla *et al.*, 2021; 2024). At present, migrants represent 3.5% of the global population (Pabbla *et al.*, 2021; 2024). According to the International

Organization for Migration, a migrant is defined as any person who moves within a country, away from their usual place of residence, or who crosses an international border, regardless of legal status, whether the movement is voluntary or involuntary, the reasons for the movement, or its duration (Pabbla *et al.*, 2021).

Although international migration receives greater visibility, most migrants worldwide remain in their countries of origin, and internal migration flows are more numerous (McAuliffe & Oucho, 2024). In Brazil, alongside international migration, intense internal movements have historically shaped the country's demographic and socioeconomic dynamics (Brazilian Institute of Geography and Statistics [IBGE], 2025). According to the most recent data from the 2022 Brazilian Demographic Census (IBGE, 2025), 19.2 million people live in a different region from where they were born, and 29.0 million individuals reside in a state other than their state of birth, highlighting the magnitude of internal and interstate migration in the country. This scenario highlights the need to investigate migration in Brazil, yet population-based studies with representative samples remain scarce, particularly those examining its relationship with health and oral health. Migration can influence oral health through multiple pathways, as territorial mobility may affect access to dental care and preventive oral health behaviors (Aarabi *et al.*, 2022; Agudelo-Suárez *et al.*, 2020; Lauritano *et al.*, 2021; Li *et al.*, 2023; Muñoz-Pino *et al.*, 2018; Pabbla *et al.*, 2024; Wilson *et al.*, 2018). Understanding these mechanisms is essential for identifying inequalities between migrants and non-migrants and for clarifying their implications for the use of oral health services.

This study contributes to a broader understanding of the topic and expands the literature on oral health among migrant populations by providing population-based evidence on inequalities in oral health in Brazil, with a specific focus on sex differences and dental care. To our knowledge, no previous population-based studies in Brazil or Latin America have examined oral health in relation to migration status while stratifying analyses by sex. Among the few existing studies in these regions, most have focused on refugee populations and have generally neither addressed sex differences nor been based on representative population samples. By addressing this gap, this study offers novel insights into how migration status and sex interact to shape oral health inequalities, providing valuable evidence to inform the development of inclusive and equitable oral health policies. Guided by this context, the present study addresses the following research questions:

(i) Do oral health conditions differ between migrants and non-migrants living in Campinas, São Paulo?
(ii) Do these differences vary according to sex?

Thus, this study aimed to analyze the oral health conditions among migrants aged 10 years and older living in Campinas, São Paulo, both overall and by sex.

These contributions can inform strategic clinical, social, and political actions aimed at improving oral health among migrant populations. The remainder of this paper is organized as follows: Section 2 presents the literature review, Section 3 describes the data and methods, Section 4 reports the main results, Section 5 presents the discussion, and Section 6 concludes the study.

2. Literature review

Brazil is a large country with substantial internal migration flows, and research has shown marked regional variation in oral health, with the South and Southeast having the best indicators and the North, Northeast, and Midwest having the worst (Ministry of Health, 2024). The country has also become one of the main destinations for international migration in South America in recent decades (National Secretariat of Justice, 2024). Data from the most recent migration report indicated that between 2010 and 2024, more than 1.7 million migrants were registered in Brazil, the majority originating from Venezuela, Haiti, Bolivia, and Colombia (National Secretariat of Justice, 2024).

The state of São Paulo has historically played a central role in both in-migration and out-migration, consolidating itself as the main hub of population redistribution in Brazil (IBGE, 2025). It is the federative unit with the largest number of non-native residents, totaling 8.6 million people (IBGE, 2025). Campinas, located in the state of São Paulo, has emerged as a major urban center recognized for its high quality-of-life indicators among large Brazilian cities, including access to sanitation, healthcare, education, communication infrastructure, and environmental quality (Wilm *et al.*, 2025). These factors contribute to its position as a destination for migrants with diverse socioeconomic backgrounds from various regions (Wilm *et al.*, 2025). The city also has a well-established primary oral healthcare network, composed of 123 oral health teams linked to the Family Health Strategy, as well as Centers for Dental Specialties and a technical staff of dentists working in primary health units (Campinas Municipal Health Department, 2024).

Migration involves changes in social support networks, access to services, and healthcare trajectories (Dao *et al.*, 2021; Pabbla *et al.*, 2024). Relocation can interrupt continuity of care, hinder the establishment of relationships with local services, and negatively impact preventive health practices (Dao *et al.*, 2021; Pabbla *et al.*, 2024; Valdez *et al.*, 2022). This context affects not only general health but also the oral health of migrants, influencing access to dental

care and the maintenance of regular dental visits (Aarabi *et al*., 2022; Agudelo-Suárez *et al*., 2020; Lauritano *et al*., 2021; Li *et al*., 2023; Muñoz-Pino *et al*., 2018; Pabbla *et al*., 2024; Wilson *et al*., 2018). These factors may contribute to adverse oral health outcomes and negatively affect the overall well-being of migrant populations (Dao *et al*., 2021; Pabbla *et al*., 2024; Valdez *et al*., 2022).

Migration, whether internal or international, is associated with adverse oral health outcomes, such as a higher prevalence of untreated tooth decay, severe periodontitis, and tooth loss (Aarabi *et al*., 2022; Al-Haboubi *et al*., 2013; Lauritano *et al*., 2021; Li *et al*., 2023). Disparities in oral health between migrant and host populations have been widely documented, with evidence generally showing that migrants have poorer oral health conditions compared with local populations (Aarabi *et al*., 2022; Agudelo-Suárez *et al*., 2020; Lauritano *et al*., 2021; Li *et al*., 2023; Muñoz-Pino *et al*., 2018; Pabbla *et al*., 2024; Wilson *et al*., 2018).

In addition to socioeconomic inequalities, demographic characteristics, such as sex, age, race/skin color, and place of residence may also play important roles (Lauritano *et al*., 2021; Pabbla *et al*., 2021). Moreover, previous studies have shown that migrant populations are more likely to experience inadequate oral healthcare, greater reliance on emergency dental services, and lower coverage by dental insurance plans (Dahlan *et al*., 2019; Dao *et al*., 2021; Pabbla *et al*., 2021; 2024). In high-income countries, these inequalities are linked to the absence of dental insurance, and in the United States, one study found that migrants are less likely to pay for dental insurance and that having this benefit may aid in reducing oral health disparities relative to the local population (Wilson *et al*., 2018). Among migrants, having insurance is associated with a higher number of dental visits and a lower risk of complications (Aarabi *et al*., 2022; Fagundes *et al*., 2021; Li *et al*., 2023; Pabbla *et al*., 2021; Wilson *et al*., 2016; 2018).

In Spain, Agudelo-Suárez *et al*. (2020) identified a higher prevalence of tooth loss among migrants compared to the local population. Studies conducted in Canada (Li *et al*., 2023), the Netherlands (Pabbla *et al*., 2024), Spain (Agudelo-Suárez *et al*., 2020), and the United States (Shelley *et al*., 2011) have reported more negative self-perceptions of oral health among migrants. Previous research has also observed greater use of emergency dental services among migrant populations (Aarabi *et al*., 2022; Lauritano *et al*., 2021; Pabbla *et al*., 2021).

There is also evidence that the migration process differs between women and men (McAuliffe & Oucho, 2024), and these differing trajectories may affect oral health indicators, reinforcing the need for analyses that consider sex differences. Generally, men tend to migrate in response to labor demands, often in informal or high-turnover sectors. In contrast, women migrate for work opportunities as well as for family reunification or to seek social support networks (McAuliffe & Oucho, 2024). Overall, men tend to exhibit lower adherence to oral hygiene practices, such as tooth brushing and flossing, and have higher prevalence rates of oral cancer, dental trauma, and periodontal disease (Aarabi *et al*., 2022; Lauritano *et al*., 2021; Lipsky *et al*., 2021; Nico *et al*., 2016). While women tend to prioritize preventive and esthetic dental care, men, especially those in migratory contexts, use dental services less frequently and usually only in emergencies (Aarabi *et al*., 2022; Lauritano *et al*., 2021; Lipsky *et al*., 2021; Muñoz-Pino *et al*., 2018; Pabbla *et al*., 2021; Wilson et al., 2016). Furthermore, studies have shown that men have the lowest frequency of positive self-perception regarding oral health (Nico *et al*., 2016; Fagundes *et al*., 2021).

3. Data and methods

3.1. Sampling and data collection

This study was based on data from the third population-based Health Survey in the Municipality of Campinas (ISACamp 2014/2015), carried out by the team from the Collaborating Center for Health Situation Analysis at the Faculty of Medical Sciences, State University of Campinas. Data access for this study was granted through formal authorization from the ISACamp coordination team (Barros & Lima, 2025). The replication data can be found in the university's data repository.

The Health Survey in the Municipality of Campinas is a cross-sectional, population-based study, conducted with a representative sample of the non-institutionalized urban population of Campinas, São Paulo, Brazil, during 2014/2015 (Barros & Lima, 2022). The sample consisted of 3,019 individuals, aged 10 years or older, who were interviewed. The survey sample was obtained using two-stage probabilistic cluster sampling, with census tracts and households as the first- and second-stage units. In the first stage, 70 census tracts were selected proportionally to the number of households (14 tracts in each of the five health districts of Campinas). In the second stage, households were selected through systematic sampling based on updated household lists.

The survey domains were defined by the following age groups: 10–19 years (adolescents), 20–59 years (adults), and 60 years or older (older adults). The sample size was determined based on a 50% proportion estimate (corresponding to the maximum variability in the frequency of the outcomes studied), a 95% confidence interval (CI), a sampling error of 4–5% points, and a

design effect of 2. This resulted in target samples of 1,000 adolescents, 1,400 adults, and 1,000 older adults.

Based on the 2010 census, the probability distribution of the number of people per household in each age group across the five districts was estimated. A total of 3,119 households with adolescents, 1,029 households with adults, and 3,157 households with older adults were independently selected for interviews to reach the desired sample sizes. These selections already accounted for expected non-response rates of 27%, 22%, and 20%, respectively, for the three age groups. All residents within the relevant age group in each household were interviewed. The final sample consisted of 1,023 adolescents, 1,011 adults, and 987 older adults, totaling 3,019 participants.

Data were collected using a pre-coded questionnaire composed primarily of closed-ended questions, organized into 13 thematic blocks. Interviews were conducted in person by trained and supervised interviewers, and data were recorded using tablet computers.

3.2. Analyzed variables

The dependent variables (outcomes) were: (i) Dental health service utilization, including reason for appointments (routine visit, orthodontic treatment, emergency care, prosthetic treatment, tooth extraction), negative self-rated dental service (fair, poor, very poor), type of service (public, private, health insurance plan), and inability to access emergency care; and (ii) oral health conditions, including tooth loss (partial, total), non-use of prostheses, negative self-rated oral health (fair, poor, very poor), difficulty speaking due to dental issues, and embarrassment about smiling.

Demographic and socioeconomic variables used to characterize the population included sex (female, male); age group (10–19, 20–39, 40–59; 60+); marital status (married/living with partner, single, separated/divorced, widowed); religion (Catholic, Evangelical, none); race/skin color (White, Black/Mixed-race); paid work (yes, no); income (<1, 1–3, >3 minimum wages); years of schooling (0–3, 4–8, 9–11, 12+); and region of origin (Southeast, Northeast, South, North, Midwest, another country). Income was categorized according to monthly earnings expressed in minimum wages: <1 minimum wage (low income), 1–3 minimum wages (lower-middle to middle income), and >3 minimum wages (higher income).

The independent variable (exposure) was place of birth, assessed through the question: "Where were you born?" with the following response options: In Campinas, in another municipality in the state of São Paulo, in another Brazilian state, or in another country. For this study, participants who reported not being born in Campinas were classified as migrants. No refugees were identified in the sample.

3.3. Statistical analysis

All analyses accounted for the complex survey design and non-response weights. The survey module in Stata 14.0 was used. Prevalence was estimated for the categorical variables related to oral health and migration, and associations were assessed using the Rao–Scott corrected chi-squared test. Prevalence ratios (PR) were also estimated using multivariable Poisson regression with robust variance, with a 5% significance level. Variables included in the adjusted models were selected based on a directed acyclic graph developed to represent the relationships between internal migration, sociodemographic conditions, and oral health (Rothman *et al*., 2008). Analyses were stratified by sex, age, years of schooling, race/skin color, and region of origin were used as adjustment variables.

4. Results

Among the selected households, 4.6% refused to participate, and 3.2% were lost for other reasons. Among all individuals aged 10 years and older identified in the selected households, the non-response rate was 17.4%, and other losses accounted for 1.7%. After accounting for these exclusions, the final sample included 3,019 participants aged 10 years or older.

Table 1 shows the distribution of demographic and socioeconomic characteristics of non-migrants and migrants residing in Campinas. The age distribution revealed distinct profiles; while most participants born in Campinas were aged 20–39 years (46.2%), most migrants were aged 40–59 years (38.2%). Regarding marital status, 59.2% of migrants were married or living with a partner, whereas 51.8% of non-migrants were single. In terms of race/skin color, Black or Mixed-race individuals represented 36.3% of migrants and 30.5% of those born in Campinas. Years of schooling also differed: 33.0% of participants born in Campinas had 12 years of schooling or more, compared to 25.6% of migrants; meanwhile, 4–8 years of schooling was more frequent among migrants (36.8% vs. 30.5%). Regarding place of origin, most migrants living in Campinas came from other regions of Brazil, predominantly from the Southeast (66.9%), followed by the Northeast (19.9%), South (7.1%), North (3.3%), and Midwest (1.4%). Only 1.4% were international migrants, indicating that migration to Campinas is mainly an internal phenomenon within Brazil.

Most migrants in this study had been living in Campinas for over 15 years (63.4%) and primarily originated from the Southeast (66.9%) and Northeast (19.9%) regions

Table 1. Demographic and socioeconomic characteristics of non-migrants and migrants aged 10 years or older in Campinas

Characteristics	Non-migrant		Migrant		*p-value
	[a]*n*	Percentage	[a]*n*	Percentage	
Sex					0.093
Female	764	50.03	888	53.92	
Male	718	49.97	649	46.08	
Total	1,482	100	1,537	100	
Age group (years)					$p<0.000$
10–19	818	26.4	202	5.8	
20–39	300	46.2	249	33.9	
40–59	132	19.5	332	38.2	
60+	232	7.9	754	22.1	
Marital status					$p<0.000$
Married or living with a partner	376	39.5	782	59.2	
Single	972	51.8	361	23.3	
Separated/divorced	52	5.2	129	9.4	
Widowed	82	3.4	264	8.1	
Race/skin color					0.036
White	961	69.5	939	63.7	
Black/mixed-race	506	30.5	556	36.3	
Paid work					0.143
No	981	45.4	916	41.5	
Yes	501	54.6	620	58.5	
Per capita income (in minimum wages)					0.795
<1	690	39.6	596	37.3	
>1–3	656	47.2	768	49.5	
>3	134	13.2	163	13.2	
Years of schooling					$p<0.000$
0–3	84	3.3	346	13.0	
4–8	635	30.5	640	36.8	
9–11	490	33.2	318	24.6	
12+	273	33.0	233	25.6	
Length of residence					$p<0.000$
0–15 years	510	19.2	460	36.5	
16+ years	972	80.8	1,077	63.4	
Region of origin					-
Southeast	-	-	1,028	66.9	
Northeast	-	-	306	19.9	
South	-	-	109	7.1	
North	-	-	52	3.3	
Midwest	-	-	21	1.4	
Another country	-	-	21	1.4	

Notes: [a]*n* indicates the number of individuals in the unweighted sample; *$p<0.05$ represents a significant association.

(Table 1). In addition, years of schooling among migrants varied by their place of origin. Only 7.0% of migrants from the Northeast had 12 or more years of schooling, compared to 31.2% of those from the Southeast. Conversely, 20.6% of Northeastern migrants had up to 3 years of schooling, compared to 11.6% of migrants from the Southeast.

Table 2 presents the prevalence of oral health indicators among migrant and non-migrant populations in Campinas. The bivariate analysis identified statistically significant associations for several aspects, including tooth loss (partial and total), self-rated oral health, types of dental visits (routine, orthodontics, emergency, prosthetics, extractions), type of service (public or health insurance plan), inability to access emergency care, difficulty speaking due to dental issues, and embarrassment about smiling.

A higher prevalence of tooth loss, lower rates of routine and orthodontic visits, greater use of prosthetic and extraction services, lower utilization of health insurance plans, and greater embarrassment about smiling were found among male and female migrants compared to the non-migrant population. Among male migrants, in addition to these differences, worse self-rated oral health, more frequent emergency visits, greater difficulty speaking due to dental issues, and increased difficulty accessing emergency services were also observed ($p<0.05$). Among female migrants, lower use of dental prostheses was also noted among those with missing teeth ($p<0.05$) (Table 3).

Multivariate analyses, adjusted for age, race/skin color, years of schooling, and place of origin, indicated that the migrant population had poorer oral health compared to the non-migrant population in Campinas. Migrants had a higher prevalence of partial tooth loss (PR: 1.27; 95% CI: 1.08–1.49), more difficulty accessing dental care, especially emergency care, in which they were more likely to be unable to obtain treatment (PR: 1.71; 95% CI: 1.07–2.74), and more negative self-rated evaluation of dental services (PR: 1.81; 95% CI: 1.15–2.85). The remaining associations lost statistical significance after adjustment (Table 4).

Given the significant differences identified between migrants and non-migrants, a stratified analysis by sex was performed. Compared to the male population born in Campinas, male migrants had a higher prevalence of tooth loss (PR: 1.47; 95% CI: 1.17–1.83), worse self-rated oral health (PR: 1.74; 95% CI: 1.19–2.53), greater frequency of emergency visits (PR: 1.66; 95% CI: 1.08–2.54), and more difficulty accessing emergency care (PR: 2.51; 95% CI: 1.15–5.47). They also had lower utilization of dental insurance (PR: 0.49; 95% CI: 0.29–0.82), higher use of private dental services (PR: 1.18; 95% CI: 1.03–1.35), more negative evaluations of dental services (PR: 2.28; 95 % CI: 1.05–4.96), greater difficulty speaking due to

Table 2. Prevalence of oral health indicators in the study population

Oral health and dental appointments	[a]*n*	Non-migrant	[a]*n*	Migrant	*p*-value
Tooth loss					
One or more teeth (but not all)	353	30.1 (26.8–33.7)	784	55.5 (51.4–59.7)	<0.000*
Complete tooth loss	82	3.1 (1.9–4.7)	359	12.3 (10.4–14.5)	<0.000*
Does not use a prosthesis (among those with tooth loss)	194	54.1 (46.3–61.7)	407	49.5 (45.3–53.2)	0.251
Negative self-rated oral health	260	18.1 (15.0–21.6)	438	28.9 (25.4-32.7)	<0.000*
Type of dental visit					
Routine	657	49.6 (44.8–54.4)	514	39.0 (34.2–43.6)	<0.000*
Orthodontic	247	13.3 (11.3–15.8)	78	5.2 (3.5–7.7)	<0.000*
Emergency	269	19.5 (16.9–22.4)	313	25.0 (22.1–28.1)	0.005
Prosthetic	129	6.9 (5.2–9.1)	391	15.9 (13.4–18.8)	<0.000*
Tooth extraction	82	5.6 (4.3–7.2)	135	9.5 (7.7–11.7)	<0.000*
Negative self-rated dental service	134	8.5 (6.9–10.4)	156	10.3 (8.2–12.8)	0.171
Type of dental service					
Public	303	17.5 (14.3–21.2)	366	20.9 (17.6–24.6)	0.040*
Private	826	58.0 (53.1–62.7)	953	62.1 (58.0–66.0)	0.095
Health insurance	245	20.3 (16.8–24.3)	136	13.2 (10.5–13.2)	<0.000*
Unable to access emergency dental care	76	4.7 (3.5–6.4)	98	7.5 (5.3–10.4)	0.007*
Difficulty speaking due to dental issues	11	0.8 (0.3–1.7)	62	3.0 (2.0–4.4)	<0.000*
Embarrassment about smiling	49	3.2 (2.3–4.4)	156	7.7 (5.8–10.1)	<0.000*

Notes: [a]*n* indicates the number of individuals in the unweighted sample; *$p<0.05$ represents a significant association.

dental issues (PR: 9.41; 95% CI: 1.58–55.7), and greater embarrassment about smiling (PR: 2.83; 95% CI: 1.06–7.58). These differences were not observed among female migrants, whose oral health indicators and use of dental services did not show statistically significant associations after adjustment (Table 5).

5. Discussion

The results of this study revealed significant differences in oral health conditions between migrants and non-migrants living in Campinas, with these differences observed only among men. These findings can be understood in light of the distinct migratory trajectories experienced by men and women (McAuliffe & Oucho, 2024). Notably, although interrelated, migratory processes have different motivations and consequences depending on the individual's sex (McAuliffe & Oucho, 2024). These differences in social and economic integration impact the degree of vulnerability experienced by migrants of each sex, which in turn affects their access to health services and oral health conditions.

In line with other studies, the migrant population showed poorer oral health compared to the local population (Aarabi *et al.*, 2022; Agudelo-Suárez *et al.*, 2020; Al-Haboubi *et al.*, 2013; Lauritano *et al.*, 2021; Li *et al.*, 2023; Pabbla *et al.*, 2021, 2024; Wilson *et al.*, 2018). According to the results of this study, male migrants tend to face worse oral health outcomes, as they are exposed to risk factors associated both with territorial displacement and with behaviors typically less focused on preventive care. Sex-related inequalities in oral health remain underestimated and neglected within the broader context of well-being (Lipsky *et al.*, 2021; Pabbla *et al.*, 2021, 2024). This highlights the importance of further research to explore these disparities and of incorporating them into strategies for prevention, education, and care to improve men's oral health, particularly that of male migrants.

The higher prevalence of tooth loss among male migrants, observed even after adjusting for age, years of schooling, race/skin color, and place of origin, reinforces the idea that the internal migratory process alone contributes to cumulative differences in access to care and use of services. In Spain, Agudelo-Suárez *et al.* (2020) found a similar pattern. Although Brazil lacks extensive literature on internal migration and oral health, evidence from other contexts shows that territorial mobility, even without language barriers, can hinder the establishment of continuous care (Aarabi *et al.*, 2022; Li *et al.*, 2023). As a result, preventive practices are delayed, and conditions that could have been treated early progress to extractions (Agudelo-Suárez *et al.*, 2020). In addition, financial

Table 3. Prevalence of oral health indicators in the study population categorized by sex

Oral health and dental appointments	[a]*n*	Non-migrant	[a]*n*	Migrant	*p*-value
Male					
Tooth loss					
One or more teeth (but not all)	152	27.4 (23.0–32.3)	356	58.2 (52.6–63.7)	<0.000*
Complete tooth loss	33	2.6 (1.5–4.7)	117	9.6 (7.8–11.9)	<0.000*
Does not use a prosthesis (among those with tooth loss)	82	52.0 (41.6–62.2)	220	57.8 (52.0–63.4)	0.334
Negative self-rated oral health	112	14.8 (11.8–18.4)	205	33.0 (28.3-38.1)	<0.000*
Type of dental visit					
Routine	319	48.6 (43.0–54.4)	204	35.0 (29.3–41.2)	<0.000*
Orthodontic	119	13.5 (10.5–17.2)	30	4.9 (2.8–8.5)	<0.000*
Emergency	134	19.5 (16.0–23.6)	158	29.6 (24.9–34.8)	0.002*
Prosthetic	55	7.3 (4.7–11.1)	141	14.5 (11.3–18.5)	<0.000*
Tooth extraction	42	5.7 (3.7–8.5)	74	10.4 (7.6–14.11)	0.009*
Negative self-rated dental service	61	9.2 (6.9–12.1)	173	11.1 (8.0–15.2)	0.346
Type of dental service					
Public	159	17.0 (13.3–21.4)	157	20.6 (16.9–24.8)	0.140
Private	382	57.9 (51.7–63.8)	392	63.5 (58.5–68.3)	0.143
Health insurance	121	20.0 (15.6–25.3)	53	10.9 (7.7–15.1)	<0.000*
Unable to access emergency dental care	27	3.2 (1.9–5.2)	41	7.5 (4.7–11.9)	0.006*
Difficulty speaking due to dental issues	5	0.45 (0.12–1.6)	24	3.2 (1.9–5.4)	0.002*
Embarrassment about smiling	20	1.8 (1.0–3.1)	58	7.1 (4.8–10.4)	<0.000*
Female					
Tooth loss					
One or more teeth (but not all)	201	32.8 (28.6–37.4)	428	53.3 (48.4–58.6)	<0.000*
Complete tooth loss	49	3.5 (2.3–5.3)	242	14.6 (11.9–17.9)	<0.000*
Does not use a prosthesis (among those with tooth loss)	112	55.8 (47.7–63.9)	187	42.3 (37.9–46.9)	0.001*
Negative self-rated oral health	148	21.3 (15.0–21.6)	233	25.4 (21.1–30.3)	0.137
Type of dental visit					
Routine	338	50.6 (44.8–56.5)	310	42.3 (37.3–47.6)	0.030*
Orthodontic	128	13.2 (10.3–16.7)	48	5.5 (3.6–8.2)	<0.000*
Emergency	135	19.4 (15.4–24.2)	155	21.1 (17.8–24.9)	0.563
Prosthetic	74	6.5 (4.7–8.9)	250	17.1 (14.2–20.5)	<0.000*
Tooth extraction	40	5.5 (3.8–8.0)	81	8.7 (6.7–11.4)	0.017*
Negative self-rated dental service	73	7.8 (5.8–10.5)	83	9.6 (7.5–12.3)	0.261
Type of dental service					
Public	144	18.0 (14.2–22.7)	209	21.2 (17.5– 25.5)	0.157
Private	444	58.1 (52.6–64.0)	561	60.9 (55.8–65.7)	0.427
Health insurance	124	20.5 (16.4–25.4)	83	15.2 (12.0–19.1)	0.047*
Unable to access emergency dental care	49	6.3 (4.1–9.4)	57	7.4 (5.2–10.5)	0.411
Difficulty speaking due to dental issues	6	1.2 (0.4–3.0)	38	2.8 (1.7–4.7)	0.090
Embarrassment about smiling	29	4.6 (3.0–7.0)	98	8.1 (6.0–10.9)	0.007*

Notes: [a]*n* indicates the number of individuals in the unweighted sample; *$p<0.05$ represents a significant association.

demands and family responsibilities can postpone dental care (Aarabi *et al.*, 2022; Agudelo-Suárez *et al.*, 2020). In this study, 59.2% of migrants were married, whereas among non-migrants, this percentage was 39.5%, suggesting that

Table 4. Prevalence ratio of oral health indicators in the migrant population of Campinas

Oral health and dental appointments	PR (95% CI)[a]	PR (95% CI)[b]
Tooth loss		
One or more teeth (but not all)	1.84 (1.61–2.10)	1.27 (1.08–1.49)
Complete tooth loss	3.99 (2.58–6.19)	1.21 (0.87–1.69)
Does not use a prosthesis (among those with tooth loss)	0.91 (0.78–1.06)	1.09 (0.90–1.31)
Negative self-rated oral health	1.60 (1.34–1.89)	1.19 (0.91–1.55)
Type of dental visit		
Routine	0.78 (0.68–0.89)	0.96 (0.81–1.14)
Orthodontic	0.39 (0.26–0.58)	0.85 (0.54–1.34)
Emergency	1.28 (1.07–1.52)	1.32 (0.95–1.82)
Prosthetic	2.30 (1.73–3.06)	1.01 (0.74–1.37)
Tooth extraction	1.69 (1.29–2.20)	0.93 (0.64–1.35)
Negative self-rated dental service	1.21 (0.91–1.60)	1.81 (1.15–2.85)
Type of dental service		
Private	1.19 (1.00–1.41)	1.03 (0.81–1.31)
Public	1.07 (0.98–1.16)	1.11 (0.99–1.24)
Health insurance	0.65 (0.51–0.82)	0.72 (0.51–1.01)
Unable to access emergency dental care	1.57 (1.13–2.19)	1.71 (1.07–2.74)
Difficulty speaking due to dental issues	3.61 (1.63–8.00)	2.57 (0.89–7.45)
Embarrassment about smiling	2.39 (1.74–3.27)	1.39 (0.84–2.32)

Notes: [a]Crude prevalence ratio; [b]Adjusted for age (continuous), race/skin color, years of schooling, and region of origin.
Abbreviations: CI: Confidence interval; PR: Prevalence ratio.

family commitments may influence the prioritization of oral health.

Moreover, the greater frequency of negative evaluations of dental services used and the reported difficulty obtaining emergency care indicate potential barriers to establishing a bond with the local oral health care network—even in a city, such as Campinas, recognized as a regional hub of development and quality of life in Brazil (Wilm *et al.*, 2025). Factors, such as limited knowledge of how the public system operates may also hinder access (Cardoso dos Santos *et al.*, 2020; Lauritano *et al.*, 2021; Pabbla *et al.*, 2021; 2024), reinforcing the need for strategies that promote regular use of dental services (Lauritano *et al.*, 2021).

Poor self-rated oral health among migrant men, also observed in other countries (Agudelo-Suárez *et al.*, 2020; Li *et al.*, 2023; Pabbla *et al.*, 2024; Shelley *et al.*, 2011), reflects accumulated experiences of pain, tooth loss, and limited access to care. The predominance of emergency dental

Table 5. Prevalence ratio of oral health indicators among migrants categorized by sex

Oral health and dental appointments	PR (CI)[a]	PR (CI)[b]
Male		
Tooth loss		
One or more teeth (but not all)	2.12 (1.77–2.54)	1.47 (1.17–1.83)
Complete tooth loss	3.60 (1.99–6.52)	1.20 (0.74–1.96)
Does not use a prosthesis (among those with tooth loss)	1.11 (0.88–1.39)	1.30 (0.99–1.70)
Negative self-rated oral health	2.22 (1.72–2.87)	1.74 (1.19–2.53)
Type of dental visit		
Routine	0.72 (0.59–0.86)	0.90 (0.68–1.19)
Orthodontic	0.36 (0.20–0.64)	1.31 (0.59–2.90)
Emergency	1.51 (1.16–1.96)	1.66 (1.08–2.54)
Prosthetic	1.98 (1.32–2.97)	0.84 (0.51–1.36)
Tooth extraction	1.82 (1.15–2.88)	0.81 (0.45–1.42)
Negative self-rated dental service	1.20 (0.81–1.79)	2.28 (1.05–4.96)
Type of dental service		
Public	1.21 (0.93–1.57)	1.20 (0.82–1.75)
Private	1.09 (0.96–1.24)	1.18 (1.03–1.35)
Health insurance	0.54 (0.38–0.77)	0.49 (0.29–0.82)
Unable to access emergency dental care	2.35 (1.26–4.39)	2.51 (1.15–5.47)
Difficulty speaking due to dental issues	7.20 (1.65–31.36)	9.41 (1.58–55.7)
Embarrassment about smiling	3.91 (2.00–7.63)	2.83 (1.06–7.58)
Female		
Tooth loss		
One or more teeth (but not all)	1.62 (1.36–1.92)	1.13 (0.90–1.41)
Complete tooth loss	4.18 (2.73–6.41)	1.25 (0.81–1.92)
Does not use a prosthesis (among those with tooth loss)	0.75 (0.64–0.88)	0.92 (0.74–1.16)
Negative self-rated oral health	1.19 (0.94–1.51)	0.87 (0.60–1.27)
Type of dental visit		
Routine	0.83 (0.71–0.98)	0.98 (0.79–1.22)
Orthodontic	0.41 (0.25–0.68)	0.65 (0.35–1.21)
Emergency	1.08 (0.81–1.44)	1.06 (0.65–1.74)
Prosthetic	2.63 (1.78–3.86)	1.20 (0.75–1.92)
Tooth extraction	1.57 (1.07–2.30)	1.12 (0.64–1.95)
Negative self-rated dental service	1.23 (0.85–1.79)	1.56 (0.85–2.84)
Type of dental service		
Public	1.17 (0.93–1.47)	0.92 (0.63–1.34)
Private	1.04 (0.93–1.17)	1.05 (0.88–1.25)
Health insurance	0.74 (0.55–0.99)	0.90 (0.56–1.46)
Unable to access emergency dental care	1.17 (0.79–1.75)	1.33 (0.66–2.64)
Difficulty speaking due to dental issues	2.32 (0.84–6.40)	0.98 (0.24–3.90)
Embarrassment about smiling	1.77 (1.16–2.69)	0.91 (0.45–1.83)

Notes: [a]Crude prevalence ratio; [b]Adjusted for age (continuous), race/skin color, years of schooling, and region of origin.
Abbreviations: CI: Confidence interval; PR: Prevalence ratio.

visits in this group reinforces a reactive pattern of service use, as previously described in other studies (Aarabi *et al*., 2022; Lauritano *et al*., 2021; Pabbla *et al*., 2021). Even in the presence of publicly available services, factors, such as territorial adaptation and long working hours appear to discourage migrants from seeking preventive care.

The lower use of dental insurance among migrant men also reflects specific conditions of this group. This finding is consistent with evidence from studies conducted in the United States (Wilson *et al*., 2018). Furthermore, part of this difference may be attributed to their older age profile, as many migrated during decades in which the provision of private health insurance by companies was less widespread or limited to higher-ranking positions, which still impacts coverage today (Souza Júnior *et al*., 2021; Lauritano *et al*., 2021; Shelley *et al*., 2011). It is also possible that some of these migrants are engaged in self-employed or informal work activities, which do not offer supplementary benefits, thereby reinforcing their dependence on the public system or occasional private care, as indicated by the higher prevalence of private consultations observed in this study.

Another point to highlight is that, despite Campinas's well-developed healthcare infrastructure, the results indicated that among male migrants, engagement with the public system is not fully established, as reflected in the lower frequency of routine consultations and higher use of emergency services and private care. The use of private services may indicate both barriers to adherence to care within the local Unified Health System and short-term strategies to address immediate needs through private alternatives.

Finally, the higher prevalence of embarrassment about smiling and difficulty speaking due to dental issues among migrant men can be linked to other oral health outcomes found in this group. Severe tooth loss, associated with the low frequency of routine dental visits, impacts not only chewing function but also oral esthetics, negatively affecting self-esteem and social interaction (Bitencourt *et al*., 2019; Lauritano *et al*., 2021). In this context, the embarrassment about smiling emerges as a direct expression of the cumulative impacts of lacking continuous and comprehensive access to oral health services, revealing significant psychosocial repercussions among migrant men. These findings suggest that internal migration, even within the same country, is not neutral from the perspective of oral health care, as it involves disruptions in continuity of care, adjustments to local systems, and new family strategies to manage health needs, particularly among those who migrate in search of better opportunities but face barriers in accessing public or private services.

Some limitations should be considered when interpreting our results. As the results are based on cross-sectional data, it is not possible to infer causal relationships; only associations can be identified. However, it is reasonable to assume that oral health status is a result of the migratory condition, and not the opposite. Furthermore, the information was obtained through self-report, which may introduce measurement bias. Nonetheless, the use of self-reported data in large samples is a widely adopted practice, as it reduces costs, and previous studies have shown high agreement between self-reported data and data collected through clinical examinations (Ramos *et al*., 2013). Moreover, generalizing the findings to other migrant populations should be done with caution, given the cultural and socioeconomic diversity of these populations.

This study also has notable strengths. Its originality lies in addressing oral health inequalities between migrants and non-migrants within the context of internal migration, a dimension often overlooked in the literature. Given the recent intensification of international migration in Brazil, with more than 1.7 million registrations between 2010 and 2024 (National Secretariat of Justice, 2024), understanding the challenges faced by internal migrants provides valuable insights for developing more inclusive public policies aimed at promoting equity in access to oral healthcare. In terms of methodological rigor, data were obtained from a representative sample of the Campinas population. In addition, the analyses were robust, with results adjusted for potential confounders, and the non-response rate was relatively low for a household survey.

6. Conclusion

Campinas is the third-ranked city in quality of life among municipalities with over one million inhabitants, according to Social Progress Index indicators, which helps explain why the city attracts migrants from various socioeconomic backgrounds and places of origin (Wilm *et al*., 2025). However, we conclude that attractiveness alone does not ensure equitable access, which underscores the importance of policies that recognize the impact of territorial mobility on oral health and consider targeted strategies for migrant men, a population that historically tends to neglect preventive practices and seek services in emergency situations. These results highlight the need for public health strategies that enhance the continuity of dental care for migrant populations, particularly for men, who tend to underutilize preventive services. Expanding outreach actions, integrating oral health into primary care for mobile populations, and training health professionals to address gender- and migration-related barriers are essential steps toward reducing inequities. Furthermore, population-based studies with larger and more diverse samples of migrants should investigate how migration type, length of residence, and occupational conditions

influence oral health outcomes in Brazil. It is noteworthy that a significant portion of the migrant population consists of individuals who have moved within their own country. Considering the inequalities observed in this study among local migrants, we believe that such disparities may be even more pronounced among those who migrate to Brazil from other, especially poorer, countries.

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Conflict of interest

The authors declare they have no competing interests.

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Writing – review & editing: All authors

Ethics approval and consent to participate

The present study was approved by the Research Ethics Committee (Comitê de Ética em Pesquisa - CEP, equivalent to Institutional Review Board [IRB]) of the School of Medical Sciences at the University of Campinas (Certificate No. 75614823.5.0000.5404). Written informed consent was obtained from all participants before their inclusion in the survey.

Consent for publication

Written informed consent was obtained from all participants to publish their anonymized data.

Availability of data

The datasets generated and/or analyzed during the present study are not publicly available but are available from the corresponding author on reasonable request.

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