



Dental caries, oral hygiene status and deleterious habits among migrant construction workers of Belagavi, India

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Keywords

Dental caries • Migrant construction worker • Occupational health • Oral health, oral hygiene

Summary

Background. Occupation significantly influences oral health, with factors like the work environment, stress levels, access to dental care, and job-related habits playing crucial roles. The oral health of construction workers, especially migrant workers, is a noteworthy concern. Understanding the oral health of this population is crucial for enhancing their quality of life through various means. This study aimed to investigate the prevalence of dental caries, oral hygiene status, and deleterious habits in this occupational group of Belagavi district, Karnataka.

Materials and methods. Study design was cross-sectional in nature. Before commencement of the study a pilot study was conducted. Multi-stage random sampling technique was employed, and 610 participants were recruited for the study. Trained and calibrated examiners recorded WHO dentition status and treatment needs (2013) and Oral Hygiene Index Simplified (OHI-S).

Collected data was analyzed using descriptive analysis, chi-square, one-way ANOVA, and multiple linear regression analysis. **Results.** The prevalence of dental caries among construction workers was significantly high (81%), and poor oral hygiene was observed among 36.9% of them. The prevalence of smoking, the tobacco chewing habit, and alcohol consumption among the construction workers was found to be 21.6%, 59.9%, and 37.3%, respectively. The dependence of OHI-S and DMFT on predictors (age, gender and deleterious habits) was found to be 21.5% and 39.6%, respectively.

Conclusions. Migrant construction workers in Belagavi had a high caries prevalence, poor oral hygiene status, and a high prevalence of deleterious habits such as tobacco use. These results emphasize the necessity of awareness and dental health education programs to improve the oral health of construction workers.

Introduction

Oral health represents a foundational and integral aspect of an individual's overall well-being, demonstrating an unequivocal and substantial interconnection with an individual's quality of life [1]. The empirical evidence underscores the inextricable relationship between oral health and general health, emphasizing its profound influence on human well-being [2]. Oral diseases stand among the most prevalent non-communicable conditions, affecting diverse populations globally [3]. This evolving pattern of disease incidence is intricately linked to evolving lifestyles characterized by the consumption of high-sugar diets, widespread tobacco usage, and increased alcohol intake. High-sugar diets facilitate the proliferation of deleterious bacteria, contributing to dental caries [4]. Concurrently, tobacco usage is closely associated with heightened risks of periodontal diseases, tooth loss, and oral malignancies [5]. Excessive alcohol intake induces xerostomia, diminishing the salivary protective environment, thereby increasing susceptibility to dental caries [6]. Furthermore, it is imperative to underscore that dental caries is a multifactorial disease, its aetiology influenced by a spectrum of factors.

It is crucial to recognize the substantial impact of occupation on holistic health, encompassing physical, mental, and social well-being [7]. Various occupational factors, such as work hours and levels of job-related stress, exhibit direct associations with overall health outcomes [8]. For instance, specific professions involving extended exposure to sunlight during prolonged work shifts render individuals more vulnerable to dehydration, thereby increasing the susceptibility to dental caries [9]. Construction workers, in particular, exemplify a prime example of this challenging occupational scenario. Previous studies have unveiled a nuanced interconnection among work hours, stress and oral health within the construction workers [10]. It indicates that occupational stress is associated with adverse oral health outcomes, encompassing issues such as dry mouth, temporomandibular disorders, and other oral symptoms [11].

The construction industry holds a significant position in India's economy, serving as the second largest employer, following agriculture. India's economic framework revolves around three primary sectors: agriculture, industry, and services, with the industrial sector being a substantial contributor to the nation's overall income. According to the National Classification of Industry, the construction sector falls under code 5,

while construction workers are categorized under codes 7 and 9 in the National Classification of Occupation. It is worth noting that a substantial majority of the workforce, encompassing approximately 92% or roughly 340 million individuals, operates in the unorganized sector, with nearly half of them affiliated with the construction industry [12]. Unfortunately, health and well-being of these construction workers in this sector often receive inadequate attention within India.

Migrant construction workers, a global phenomenon contributing to the socio-economic development of many countries. With millions of migrant workers worldwide, it's crucial to ensure their well-being, at their workplace [13]. The oral and general health status of construction workers, particularly migrant labourers, stands as a pressing concern. Despite conscientious efforts to ensure worker health and safety, the statistical landscape remains disconcerting. In 2018, the International Labour Organization reported a substantial number of work-related incidents. Annually, there were 374 million documented cases of nonfatal accidents or illnesses in the workplace. Additionally, there were over 2.78 million workplace fatalities recorded [14]. In practical terms, this translates to a work-related accident transpiring every 15 seconds, affecting 150 workers, and culminating in the loss of one worker's life within each such interval [15].

Migrant construction workers, particularly those hailing from isolated villages with limited educational backgrounds and language skills, are notably less informed about preventive measures to safeguard their health [16]. Higher education often correlates with better oral hygiene habits, while language proficiency is crucial for effective communication with healthcare providers, facilitating improved access to dental services [17]. Moreover, the combination of low literacy levels and socio-economic status within this demographic results in a significant prevalence of tobacco use, both in smoking and chewing forms. Furthermore, studies have indicated that migrants exhibit elevated rates of tobacco use in comparison to the general population of their home regions [18]. The situation is further exacerbated by a lack of awareness concerning preventive measures, collectively intensifying the hurdles they encounter.

Despite being a prominent occupation in India, there exists a notable research gap concerning the oral health of this population. The scientific literature lacks an adequate number of studies on the oral health outcomes of this vulnerable population. To address this gap and contribute to the understanding of the unique challenges faced by migrant construction workers, it is essential to investigate oral health concerns within the context of occupational health. The main objectives of this study was to investigate the prevalence of dental caries, oral hygiene status, and deleterious habits among migrant construction workers in the Belagavi district, India.

Materials and methods

STUDY SETTING

This study was of a descriptive and cross-sectional design, adhering to the STROBE guidelines for comprehensive reporting. The study was carried out within the demographic of migrant construction workers of the Belagavi district, situated in the state of Karnataka, India, spanning the period from December 2022 to February 2023.

ETHICAL CONSIDERATIONS AND INFORMED CONSENT

The study protocol underwent evaluation and ethical approval from the Institutional Ethics and Research Committee. Official permission was secured from relevant construction site authorities before commencing oral examination. Study participants were thoroughly briefed on data acquisition, confidentiality measures, and study objectives, followed by obtaining written informed consent.

TRAINING AND CALIBRATION

Before the commencement of the study, a panel of experts rigorously standardized and calibrated the examiners to guarantee a consistent approach to the examinations. This process aimed to ensure uniform interpretations of the specific codes and criteria that were to be recorded. Two examiners were involved in the assessment, and the inter-examiner reliability for the World Health Organization (WHO) Oral Health Assessment Form (2013) [19] and Oral Hygiene Index Simplified (OHI-S) [20] was evaluated through Kappa statistics, yielding reliability scores of 88% and 90%, respectively affirming the precision and consistency of the data collection process. A high Cohen's Kappa score indicates a strong level of agreement between the two examiners. This statistical measure takes into account both the presence of agreement and the probability of agreement occurring by chance.

SELECTION CRITERIA

Construction workers aged 18 years and older were enrolled in the study, and exclusion criteria encompassed those who declined participation or did not provide informed consent for their involvement.

SAMPLE SIZE ESTIMATION AND SAMPLING TECHNIQUE

A pilot study was conducted among 50 participants to determine the sample size and to assess the feasibility of the study. The findings from the pilot study revealed a disparity in the prevalence of dental caries, with a prevalence of 69.18% among male construction workers and 43.75% among their female counterparts. The minimum sample size was estimated to be 550 with type I (α) error = 0.05 and Power ($1-\beta$) = 0.95 using G*Power statistical software (Ver. 3.1.9.4.). Considering 10% attrition the final sample size was rounded off to 610. Participants in this study were recruited by multi-stage

random sampling approach. The geographic area of Belagavi district was subdivided into 15 administrative talukas. Within each taluka, a single construction site was randomly selected. Each chosen construction site constituted around 35-42 migrant construction workers, thereby forming the basis for data collection within this study.

DATA COLLECTION

The study instrument was designed in alignment with the WHO Oral Health Assessment Form (1997) and comprised three distinct sections: (1) Demographic data, encompassing age and gender, (2) Assessment of deleterious habits prevalent among the construction workers, which included smoking, tobacco chewing, and alcohol consumption, and (3) Evaluation of clinical parameters, specifically DMFT (Decayed Missing Filled Teeth) Index and oral hygiene status (OHI-S).

The examiners carried out the data collection on specified dates at construction sites within the Belagavi district. A total of 610 construction workers, spanning four distinct age groups, underwent a Type III examination. The average examination duration for each subject was approximately 15 minutes and was carried out under natural light.

STATISTICAL ANALYSIS

The recorded data were entered in Microsoft Excel 2019 and analysed using IBM-SPSS® Statistics-Version 21 (IBM, USA). Descriptive statistics were computed, which included percentages, means and standard deviations. The normality of the data distribution was determined using the Shapiro-Wilk test. Chi-square test was used to check for the association of prevalence of dental caries and deleterious habits with age among the construction workers. Analysis of variance (ANOVA) test was used to check for any significant differences in the DMFT and OHI-S scores. Multiple linear regression was also performed to assess the predictors for DMFT and OHI-S. For all the tests, confidence level and level of significance were set at 95% and 5%, respectively.

Results

A total of 610 migrant construction workers were included, with 552 (90.5%) being males and 58 (9.5%) being females. The study population was distributed into four age groups: 21-30 (23.8%), 31-40 (35.6%), 41-50 (28.4%), and 51-60 (12.3%), respectively. The mean age of the population was 36.83 ± 10.45 (Tab. I).

DENTAL CARIES AND ORAL HYGIENE STATUS AMONG CONSTRUCTION WORKERS:

The prevalence of dental caries among construction workers was found to be 81%. Figure 1 depicts the age-wise distribution of dental caries. The highest prevalence was observed in the age group of 31-40 (89.4%) and the lowest in 21-30 (62.8%). When Chi-square test was

Tab. I. Demographic profile of the participants based on Gender, Age group and mean age.

Demographics variables	Frequency (%) N = 610 (100%)
Gender	
Male	552 (90.5%)
Female	58 (9.5%)
Age Group	
21-30	145 (23.8%)
31-40	217 (35.6%)
41-50	173 (28.4%)
51-60	75 (12.3%)
Age (Mean \pm SD)	36.83 ± 10.45

SD: Standard deviation; All values are expressed as frequency with percentages (in parentheses) and mean \pm SD.

applied, there was a statistically significant difference in caries prevalence among the different the age groups ($p < 0.001$) (Tab. II).

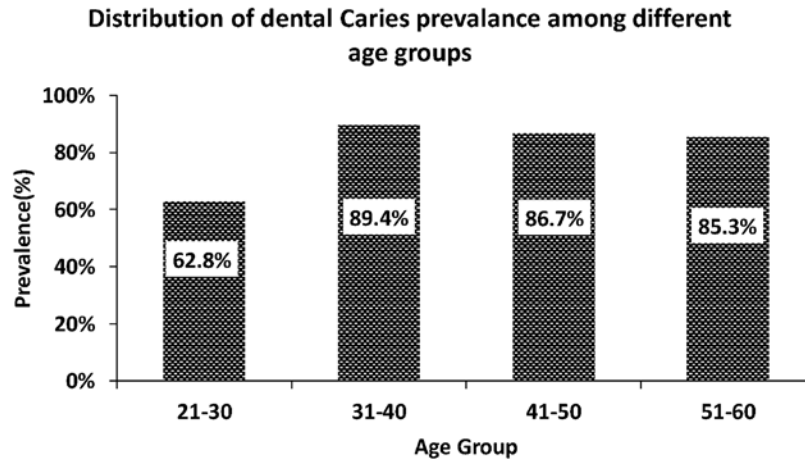
The mean DMFT of construction worker was found to be 6.77 ± 4.76 . The highest DMFT index score was in the age group of 41-50 (9.78 ± 3.61), while the lowest was in 21-30 (2.72 ± 3.03). Furthermore, when examining the individual components of the DMFT index, the filled component was highest in the age group of 31-40 (0.24 ± 0.43) and lowest in the 51-60 (0.04 ± 0.20). The missing component was highest in the age group of 51-60 (3.64 ± 2.90) and the lowest in 21-30 (0.41 ± 0.95). There was a statistically significant difference in the mean DMFT score across the four age groups using ANOVA test ($p < 0.001$) (Tab. II).

The mean OHI-S Index score of construction workers was found to be 2.55 ± 1.13 . Figure 2 depicts the distribution of Oral hygiene status among construction workers. It was observed that 51.3% of workers had fair oral hygiene, while 36.9% had poor, and only 11.8% had good oral hygiene. The highest mean OHI-S index score was in the age group of 41-50 (2.90 ± 1.25), while the lowest was in 21-30 (1.96 ± 0.70). There was a statistically significant difference in the mean OHI-S index score across the four age groups using ANOVA test ($p < 0.001$) (Tab. II).

DELETERIOUS HABITS AMONG CONSTRUCTION WORKERS

The prevalence of smoking, tobacco chewing habit, and alcohol consumption among the construction workers was found to be 21.6%, 59.9%, and 37.3%, respectively. Smoking was most prevalent in the age group of 51-60, while tobacco chewing habit and alcohol consumption was highest in the 41-50 age group. There was a statistically significant association found between smoking ($p = 0.003$), tobacco chewing ($p < 0.001$), and alcohol consumption ($p = 0.038$) with different age groups when the chi-square test was applied (Tab. III).

Fig. 1. Distribution of dental caries prevalence among different age groups of construction workers; All values are expressed in percentages.



Tab. II. Distribution of oral hygiene status, DMFT and prevalence of dental caries among different age groups of construction workers.

Parameter	Age group n (%)				p-value
	21-30	31-40	41-50	51-60	
OHI-S ^a	1.96 ± 0.70	2.53 ± 1.04	2.90 ± 1.25	2.89 ± 1.26	< 0.001*
DMFT ^a	2.72 ± 3.03	6.30 ± 4.75	9.78 ± 3.61	8.96 ± 3.71	< 0.001*
Caries prevalence^β					
Caries present	91 (62.8%)	194 (89.4%)	150 (86.7%)	64 (85.3%)	< 0.001*
Caries absent	54 (37.2%)	23 (10.6%)	23 (13.3%)	11 (14.7%)	

OHI-S: Oral Hygiene Index-Simplified; DMFT: Decayed Missing Filled teeth; All values are expressed as frequency with percentages (in parentheses) and Mean ± standard deviation (SD). The statistical test used: ^aANOVA, ^βChi-square test; level of significance: * $p \leq 0.05$ is considered statistically significant.

Tab. III. Distribution of Deleterious habits (Smoking, Tobacco and Alcohol) in different age groups.

Deleterious habits	Age groups n (%)				p-value
	21-30	31-40	41-50	51-60	
Smoking					0.003*
Smokers	38 (26.2%)	34 (15.7%)	35 (20.2%)	26 (34.7%)	
Non smokers	107 (73.8%)	183 (84.3%)	138 (79.8%)	49 (65.3%)	
Tobacco chewing					< 0.001*
Tobacco users	72 (49.7%)	121 (55.8%)	119 (68.8%)	57 (76%)	
Non-tobacco users	73 (50.3%)	96 (44.2%)	54 (31.2%)	18 (24%)	
Alcohol					0.038*
Alcohol users	56 (38.6%)	81 (37.3%)	75 (43.4%)	18 (24%)	
Non-alcohol users	89 (61.4%)	136 (62.7%)	98 (56.6%)	57 (76%)	

All values are expressed as frequency with percentages (in parentheses). The statistical test used: Chi-square test; level of significance: * $p \leq 0.05$ is considered statistically significant.

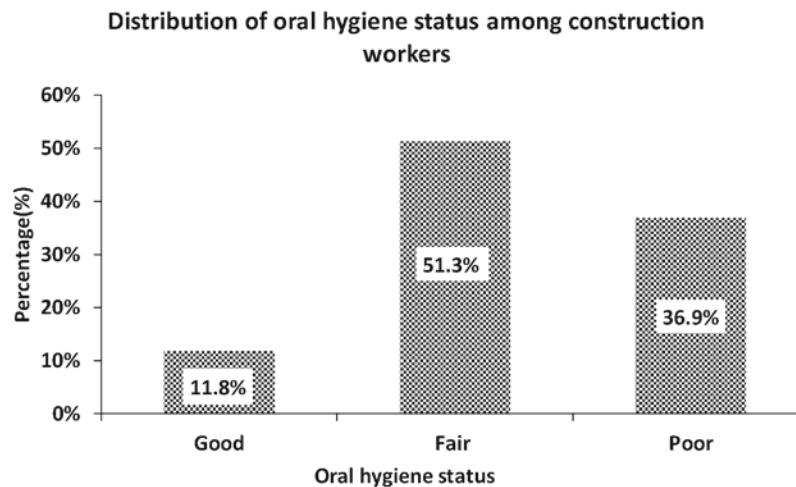
ASSOCIATION BETWEEN DEMOGRAPHIC VARIABLES AND DELETERIOUS HABITS WITH ORAL HYGIENE STATUS AND DMFT

The multiple linear regression model revealed that oral hygiene status was significantly associated with age and tobacco chewing, whereas DMFT was significantly associated with age, gender, tobacco chewing, and alcohol consumption. The dependence of OHI-S and DMFT on predictors such as age, gender and habits such as smoking, tobacco chewing and alcohol consumption was found to be 21.5% and 39.6%, respectively (Tab. IV).

Discussion

India lacks a centralized infrastructure for national oral health services, distinct from more developed countries. Focusing on the oral health status of construction workers becomes imperative to underscore the necessity for targeted health promotion and consistent oral health care services. This emphasis aims to facilitate essential health education initiatives and the implementation of preventive and curative dental care services. By elucidating the unique oral health challenges faced by

Fig. 2. Distribution of oral hygiene status among construction workers; All values are expressed in percentages.



Tab. IV. Association between Oral Hygiene Index-Simplified (OHI-S) and Decayed, Missing and Filled Teeth (DMFT) with age, gender, alcohol, smoking and tobacco.

Parameters	Coefficient r	SE	t	95% CI	p-value	Adjusted R ²
Dependent variable: OHI-S						
Constant		0.246	4.498	0.624 to 1.592	< 0.001*	0.215
Age	0.281	0.004	7.518	0.022 to 0.038	< 0.001*	
Gender	-0.029	0.146	-0.766	-0.398 to 0.175	0.444	
Smoking	-0.011	0.107	-0.285	-0.241 to 0.180	0.776	
Tobacco	0.303	0.099	7.026	0.502 to 0.892	< 0.001*	
Alcohol	0.034	0.088	0.893	-0.095 to 0.252	0.372	
Dependent variable: DMFT						
Constant		0.913	-0.728	-2.459 to 1.129	0.467	0.396
Age	0.542	0.015	16.540	0.218 to 0.276	< 0.001*	
Gender	-0.092	0.541	-2.760	-2.556 to -0.431	0.006*	
Smoking	-0.023	0.397	-0.675	-1.048 to 0.512	0.500	
Tobacco	0.134	0.368	3.540	0.580 to 2.025	< 0.001*	
Alcohol	-0.204	0.327	-6.113	-2.645 to -1.359	< 0.001*	

CI: confidence interval; SE: standard error; OHI-S: Oral Hygiene Index-Simplified; DMFT: Decayed Missing Filled teeth. The statistical analysis used: multivariate linear regression; Level of significance: * $p \leq 0.05$ is considered statistically significant.

migrant construction workers, a clearer understanding emerges of the imperative to institute comprehensive interventions. The present cross-sectional study aimed at assessing the dental caries, oral hygiene status and deleterious habits among migrant construction workers of Belagavi.

In the developing countries, internal migration is a survival strategy for many workers in search of better livelihood and opportunities. The present study was conducted among 610 migrant construction workers with a larger proportion of males than females which could be due to the safety concerns and the physical strength required for this line of work. The participant age ranged from 21 to 60 years with an average age of 36.83 ± 10.45 which was in congruence to a study conducted by Suresh et al., among the migrant workers in Chennai where most of the workers employed were above 25 years [21].

In the present study, the prevalence of dental caries was high among the age groups of 31-40 and 41-50. This

finding aligns with the outcomes of a previous study conducted by Anil et al., focusing on migrant construction laborers in Tamil Nadu wherein the prevalence was reported to be 81.5% [22]. A study conducted by Sakthi et al., reported that caries prevalence among 321 construction workers was 67% which was less than the finding of present study [23]. There was a high mean DMFT among the participants of this study. Sanadhya et al., stated that the mean DMFT score of the salt workers was (3.94 ± 3.54) which was much lower than the findings of the current study (6.77 ± 4.76) [24]. The study also identified a low number of filled teeth among construction workers, indicating an increased requirement for dental treatments and highlighting potential disparities in access to oral healthcare services within this demographic in Belagavi. The high caries prevalence among construction workers in Belagavi can be attributed to a combination of occupational and environmental factors. Construction workers often face challenging working conditions that contribute to poor oral hygiene practices among them, as

the nature of their work may limit their ability to maintain regular dental routines. Additionally, the demanding nature of construction jobs often leads to irregular eating patterns and reliance on convenient, often sugary, snacks and beverages, further exacerbating the risk of dental caries. Limited access to dental care and preventive services may also play a role, as construction workers may prioritize work commitments over seeking regular dental check-ups.

In this study, 36.9 % of the construction workers had poor oral hygiene status as deciphered by the oral hygiene index scores. In a study conducted by Bipina et al., 79.41% construction workers had poor oral hygiene and it was found that people who brushed once daily had poor oral hygiene and periodontitis [25]. Since majority of them are from rural areas, where it is presumed that they have low awareness of oral hygiene practices and consistently disregard oral health use of locally available material instead of a tooth brush and paste due to material shortage or cost concerns could be the primary cause of poor oral hygiene status among them. The workplace environment of the individuals has an influence on their oral health statuses through the behaviour and habits which are exerted by their personal and work characteristics. This observation suggests a potential correlation between the construction workers' frequency of tooth brushing, limited to once a day, and factors such as prolonged occupational demands and sleep deprivation.

Among the 610 construction workers, 59.9% self-reported tobacco use. These findings align with previous studies; Anil et al., reported a tobacco usage rate of 80.7% among construction workers, while Bipina et al., observed that smokeless tobacco (47.07%) was the predominant habit within this occupational group [22, 25]. The tobacco consumption in the study was lesser than that reported by Ansari et al., [26] (85.9%) and Aslesh et al., [27] (71.7%), but it was greater than that which was reported by Mou et al., [28] (19.1%) and Dagli et al., [29] (40.3). The National Oral Health Survey and Fluoride Mapping showed that the prevalence of smoking was 22.8% among 35- to 44-year-olds in India which was similar to this study. A rather smaller proportion of cigarette smoking (21.6%), which was similar to finding by Anil et al., [22] (25.3%), and Tirukkovalluri et al., [30] (29%). In the current study, 37.3 % of the participants reported alcohol consumption, a prevalence consistent with the findings of Anil et al., [22] (31.5%). However, this rate was lower compared to the observations reported by Aslesh et al. [27] (56.6%) and Zabeer et al. [31] (60.2%). According to World Cancer Report, in 2018 India reported 1.16 million new cancer cases and 784,800 deaths related to cancer in a population of 1.3 billion. Vulnerable population groups such as migrant workers were identified as emerging high risk groups for oral cancer owing to the high prevalence of smokeless tobacco consumption [32]. In the present study, the regression models revealed there was significant relationship between demographic profile and deleterious habits of construction workers with their oral health. These findings aligns with

those reported by Varkey et al., among fishermen population [7]. Implementing measures to reduce deleterious habits, particularly tobacco use, among construction workers can significantly enhance their oral health outcomes. Scientific evidence consistently links tobacco consumption to a heightened risk of oral health issues, including periodontal diseases and oral cancers. The cessation of tobacco use within this occupational group may lead to marked improvements in their oral health.

LIMITATIONS

This study is constrained by its cross-sectional design, preventing the establishment of a temporal relationship between lifestyle factors and oral health status. The inherent limitation lies in the inability to discern the causality or directionality of the observed associations. To address this limitation and enhance the depth of understanding, a longitudinal study focusing on the same target group is required. A longitudinal approach would provide a more comprehensive insight into the dynamic interplay between lifestyle factors and oral health among construction workers.

FURTHER SCOPE AND RECOMMENDATIONS

In contrast to several affluent nations, India lacks a comprehensive national oral health service. Although certain welfare schemes for construction workers in states like Delhi and Assam, which focuses on general healthcare, providing medical assistance for accidents and reimbursement for major diseases, dental health services are notably absent from these initiatives [33, 34]. Internationally, countries such as the UAE have successfully implemented dental health screening sessions through collaborations with dental clinics and educational institutions [35]. Drawing inspiration from these endeavours, India could benefit from coordinated efforts involving dental professionals, local manufacturing authorities, social and economic sectors, and volunteer organizations.

Establishing routine oral health care services for construction workers is imperative to provide essential health education, preventive measures, and curative dental treatments. These services should be tailored to address the specific challenges faced by the workforce, incorporating regular oral health education programs, workshops, and accessible on-site dental clinics. Targeted health promotion activities are essential, focusing on tobacco and alcohol cessation among migrant construction workers, aligning with an overarching strategy for promoting their oral health. To further reduce the incidence of caries and enhance their oral hygiene, fluoride application programs, dental sealant initiatives, and community-driven oral health campaigns should be implemented. Additionally, providing affordable and culturally sensitive interventions, such as access to oral care products and peer support, contributes to a comprehensive approach aimed at improving the oral health and overall well-being of this diverse and vital workforce.

Conclusions

This study revealed that the prevalence of dental caries was found to be high, oral hygiene status was poor, and high prevalence of deleterious habits such as tobacco was found among migrant construction workers in Belagavi, India. The current study emphasizes the necessity of an intervention to raise awareness and offer dental health education programs in order to improve the oral health of construction workers. Individuals from lower socioeconomic backgrounds desire genuine authority over decisions prioritising prophylaxis, timely diagnosis and adequate treatment delivery.

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Conflict of interest statement

There was no conflict of interests associated with this original research article.

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Authors' contributions

AP: conceptualization, investigation, project administration, visualization, writing-original draft, writing review and editing. SJ: resources, supervision, validation, data curation, formal analysis, methodology. AVA: resources, supervision, validation, writing-original draft, writing-review and editing. VNS: conceptualization, investigation, project administration, visualization, writing-original draft, writing-review and editing. KR: resources, supervision, methodology, validation, writing-review and editing. JT: software, data curation, writing-original draft and data curation. DC: resources, supervision, validation, data curation, formal analysis, methodology. LK: software, data curation, writing-original draft, writing-review and editing.

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