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Intraoral and extraoral soft tissue lesions and periodontal health in the occupational medical examination of construction workers in Lima, Peru

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ABSTRACT

Objective: To describe intraoral and extraoral soft tissue lesions and periodontal health identified during the occupational medical evaluation of operations and administrative workers in the construction sector of Lima, Peru. **Materials and methods:** A cross-sectional study conducted on 150 construction workers evaluated with a dental-occupational instrument with epidemiological indices for periodontal disease and clinical attachment loss, as well as indicators for intraoral and extraoral lesions. **Results:** The community periodontal index of young adult operations workers (bleeding = 3.58; pocket = 1.13) and mature adult operations workers (bleeding = 3.04; pocket = 1.16) was higher than that of young adult administrative workers (bleeding = 1.55; pocket = 0.73) and mature adult administrative workers (bleeding = 1.05; pocket = 0.84). Young adult operations workers (CAL= 36.50%; n = 19) and mature adult operations workers (CAL = 36.77%; n = 27) had a higher frequency of clinical attachment loss than young adult administrative workers (CAL= 18.20%; n = 7) and mature adults (CAL= 15.80%; n = 3). Regarding operations workers, 94.90% (n = 114) had gingivitis and 61.95% (n = 74) suffered from periodontitis. In addition, they showed a higher frequency of intraoral lesions (63.30% [n = 95] vs. 6.00% [n = 9]) and extraoral lesions (55.30% [n = 83] vs. 11.30% [n = 17]) compared to administrative workers. **Conclusions:** Periodontal health, clinical attachment, and intraoral and extraoral conditions of operations construction workers are significantly more impaired than those of administrative workers.

Keywords: occupational dentistry; occupational medicine; occupational exposure; occupational health; periodontal diseases; oral pathology.

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INTRODUCTION

The National Policy on Occupational Safety and Health in Peru, as well as current occupational health regulations and legislation, promote occupational medical examinations (OMEs) to determine fitness for work, accounting for exposures that may affect workers' psychophysical capacity to perform their duties. Occupational dentistry plays a crucial role in ensuring the well-being of workers in high-risk sectors such as construction, due to exposure to factors that can compromise oral health. Therefore, assessing workers' oral health is essential for the early detection of diseases and for improving their quality of life and productivity (1, 2).

In Peru, although the legislation promotes occupational health, the evaluation of the stomatognathic system remains generic, often overlooking specific pathological conditions of the soft tissues (such as gingival inflammation, periodontal pockets, attachment loss, and oral or orofacial mucosal lesions), as well as other types of hard tissue injuries (abrasion, erosion, abfraction, attrition, dental trauma) or cranio-mandibular disorders (CMDs). These conditions, as widely documented in international scientific literature, may be related to various risk factors to which the workers are exposed (3-12).

Despite this, Ministerial Resolution No. 312-2011-MINSA, which approves the Technical Document "Protocols for Occupational Medical Examinations and Diagnostic Guidelines for Mandatory Medical Examinations by Activity," includes oral health only under the "Mouth" component of the occupational medical evaluation form (2). This limitation hinders the positioning and consolidation of work-related dentistry—also known as occupational dentistry—as has occurred in other countries in the region, where postgraduate and specialization programs in this field already exist (8, 9).

The foundations of occupational health contradict what was previously mentioned, since its objective is the preservation of the highest possible level of physical, mental, and social well-being of workers, through the promotion of occupational health and hygiene; as well as the protection of health against work-related accidents or diseases caused by environmental conditions and the hazards and risks of economic activities, through disease prevention and occupational safety (13, 14).

Therefore, given the limited scientific evidence that assesses the burden of soft-tissue oral disease—most of the literature generally reports information on teeth and their dental caries experience—, coupled with the absence of standardized protocols or tools for quantifying oral damage at the clinical or epidemiological level, the true need for dental treatment among workers may be underestimated considering its relationship with their work activities (15-18).

This study addresses the significant gap in occupational health in Peru, where workers' oral health is often overlooked in occupational medical examinations or limited to caries detection using odontograms, disregarding soft tissue conditions and periodontal health. This underscores the need to integrate comprehensive stomatological assessments into occupational medical evaluations, promoting a holistic approach to occupational health that recognizes the importance of oral health for workers' overall well-being and productivity.

In this context, the aim of this study was to describe the intra- and extraoral soft tissue lesions and periodontal health conditions identified during occupational medical examinations of construction workers in Lima, Peru, according to their occupational profile and age group.

MATERIALS AND METHODS

The cross-sectional epidemiological study was conducted between January and June 2021 at a construction sector company located in Lima, Peru, with a population of 280 employees. The following statistical formula for calculating a proportion in a finite population was used:

$$n = \frac{N * Z_{\alpha}^2 * p * q}{e^2 * (N - 1) + Z_{\alpha}^2 * p * q}$$

The minimum required sample size was 116. To account for potential losses, we added 30%, yielding a final target of 150 workers. The sample size was calculated using a 95% confidence level (Z = 1.96), a 5% margin of error (d = 0.05), a prevalence (p) of 55.60%, and a complement (q) of 44.40%. The value of p was obtained from a study on the prevalence of chronic periodontitis in Ibero-America conducted by Duque (19). Considering that all employees underwent a stomatological examination as part of their occupational medical assessment, simple random sampling was applied to select the 150 participants, who were clinically evaluated using epidemiological indices for periodontal disease and soft tissue lesions.

The following inclusion criteria were established: having at least one year of employment with the company (job exposure), not having a previous "unfit" result in occupational examinations, and not having submitted the Temporary Work Disability Certificate prior to the clinical examination.

The research involved qualitative and quantitative variables related to harmful habits, oral hygiene, periodontal health, and the presence of intra- and extraoral lesions among workers of a construction company in Lima, Peru. Participants were classified by job profile (operations workers vs. administrative employees) and age group (young adult: 18-39 years, and mi-

ddle-aged adult: 40-59 years). Nominal qualitative variables included job profile and age group, as well as the presence of specific conditions (types of intra- and extraoral lesions). Ordinal qualitative variables comprised the level of tobacco and alcohol consumption and the level of oral hygiene (good, fair, and poor). Quantitative variables included discrete variables, such as the frequency of daily toothbrushing; and continuous variables, such as the number of teeth with or without gingival bleeding or periodontal pockets, and the number of individuals with or without gingivitis, periodontitis, or clinical attachment loss (CAL).

Clinical data collection was carried out through direct and structured observation as part of the stomatological examination, using epidemiological indices recommended by the World Health Organization (WHO). Sociodemographic and occupational information was obtained through a questionnaire administered prior to the clinical assessment.

An occupational stomatological epidemiological record form was designed, which included epidemiological indices for periodontal disease (gingival bleeding and shallow or deep periodontal pockets), clinical attachment loss, oral mucosal (intraoral) lesions, and orofacial (extraoral) conditions, based on the "Oral Health Surveys: Basic Methods" proposed by the WHO (20-25), as well as the Simplified Oral Hygiene Index (OHI-S) by Greene and Vermillion (26, 27), through measurement of soft and calcified bacterial plaque.

Standardized techniques were applied for oral health examinations in accordance with WHO guidelines. A pilot study with 15 construction workers was conducted to calibrate the examiners in two phases: 1) prior to the study, through theoretical discussions (Figure 1A), assessment of clinical criteria on typodonts (Figure 1B), and real clinical calibration examinations on individuals (Figure 1C); and 2) intra-study, determining the percentage of agreement and applying Cohen's Kappa coefficient, with a minimum concordance of 85–90%. Results showed "almost perfect agreement" (0.81-1.00) among examiners, according to the Landis and Koch scale.

The clinical examination was performed using the "four-handed" technique (examiner and assistant), employing a mouth mirror and a calibrated stainless-steel periodontal probe with markings at 11.5, 8.5, 5.5, and 3.5 mm, under natural light and artificial illumination support with LED lamps. All supplies and instruments met high-level disinfection (HLD) standards, ensuring ergonomic conditions suitable for patients and examiners. The data collection team complied with biosafety and standard precaution protocols established by the Ministry of Health (MINSA) (Figure 1D).

Figure 1. Occupational stomatological examination of construction sector workers. A) Theoretical calibration on indicators of soft tissue and periodontal lesions. B) Practical calibration on dental models. C) Practical calibration on a patient. D) Evaluation of intra- and extraoral soft tissue and periodontal lesions.

The data collected were stored in a database designed in Microsoft Excel® version 16.0 (Microsoft® 365 MSO) and exported to Stata® version 17.0 (StataCorp® 2021) for descriptive statistical analysis using summary measures, frequency tables, and graphs according to the variables described. For qualitative variables, percentages and absolute frequencies were used, whereas for quantitative variables with normal distribution, the arithmetic mean and standard deviation were employed to describe their behavior. It is noteworthy that no statistical inference was applied to quantitative variables; therefore, no statistical tests were performed for these variables. In contrast, inferential analysis was conducted exclusively using Fisher's exact test with a 95% confidence level ($p < 0.05$) to compare frequencies among qualitative variables.

Compliance with the security, protection, and confidentiality of sensitive data was ensured according to Law No. 29733, the Law on Personal Data Protection, by using anonymous codes on each epidemiological record. The research was approved by the Institutional Committee of Research Ethics of Universidad Científica del Sur (registration code: 072-2019-POS8). Likewise, permission was obtained from the General Management of the construction company and the authorization of its Technical Office of Safety and Health at Work. Participation of workers was voluntary and free after receiving information about the characteristics, risks, and procedures of the study, with no coercion or undue influence. Furthermore, once the clinical examinations were completed, each participant received educational material and a diagnostic report on their oral health status, preventive measures, and therapeutic needs, as well as information related to their social security or health care provider (EPS –Spanish acronym for "Entidades Prestadoras de Salud"–) to facilitate access to specialized dental care.

RESULTS

Of the total participants, 84.00% (n = 126) were male and 16.00% (n = 24) were female. Likewise, of the total, 38.00% (n = 57) of the men and 4.00% (n = 6) of the women were within the "young adult" age range (18-39 years), while 46.00% (n = 69) of the men and 12.00% (n = 18) of the women were within the "middle-aged adult" range (40-59 years). The mean age for men was 41.89 ± 9.5 years, and for women 47.58 ± 8.2 years, with a minimum age of 27 years in men and 33 years in women, and a maximum age of 59 years for both sexes.

Regarding the participants' occupational characteristics, 120 workers held operational positions, of whom 87.50% (n = 105) were men and 12.50% (n = 15) were women. Only 30 workers held administrative positions, which included coordination, supervision, management, and support roles; among them, 70.00% (n = 21) were men and 30.00% (n = 9) were women. The mean length of employment was 7.46 years for men and 7.17 years for women.

The predominant tobacco use profile was "light smoker," observed in 36.50% (n = 19) of young operations workers and 39.70% (n = 27) of middle-aged operations workers. Regarding alcohol consumption, the "occasional drinker" profile predominated among both groups of operations workers: 78.85% (n = 41) in young adults and 66.20% (n = 45) in middle-aged adults. Among administrative employees, 67.80% (n = 13) of the middle-aged adults and 53.55% (n = 6) of the young adults were nonsmokers. Conversely, among administrative employees, 33.95% (n = 4) of young adults and 27.20% (n = 5) of middle-aged adults were classified as "light smokers." Regarding alcohol consumption, 42.80% (n = 8) of middle-aged administrative employees and 19.65% (n = 2) of young administrative employees were nondrinkers. The "social drinker" profile was observed in 11.54% (n = 6) of young operations workers and 14.70% (n = 10) of middle-aged operations workers. Only three operations workers—two middle-aged (2.90%) and one young (1.92%)—were classified as "moderate drinkers." In addition, 8.80% (n = 6) of middle-aged operations workers and 5.80% (n = 3) of young operations workers were "moderate smokers." No cases of "heavy smoker" or "heavy drinker" were found. Among the total 150 participants, 56.00% (n = 84) did not consume tobacco and 16.67% (n = 25) did not consume alcohol (Table 1).

Most operations workers had fair oral hygiene—73.10% (n = 38) of young adults and 72.10% (n = 49) of middle-aged adults—whereas among administrative employees, 53.55% of young adults (n = 6) and 53.55% of middle-aged adults (n = 10) had good oral hygiene. Poor hygiene was mainly observed among middle-aged operations workers, 20.60% (n = 14), and young operations workers, 25.00% (n = 13). Regarding toothbrushing frequency, 54.40% (n = 37) of middle-aged operations workers brushed once per day, while 48.10% (n = 25) of young operations workers brushed twice per day. The lowest percentages of brushing three or more times per day were recorded among young administrative employees, 32.15% (n = 3), and middle-aged administrative employees, 21.10% (n = 4). A statistically significant difference in oral hygiene level was found between operations workers and administrative employees among both middle-aged adults ($p = 0.047$) and young adults ($p = 0.046$), suggesting that these groups have distinct oral hygiene habits (Table 2).

Table 1. Harmful habits according to occupational profile and age range among operations workers and administrative employees from a construction company in Lima, Peru, 2021.

Harmful habits	Operations workers				Administrative employees			
	Young adult (18-39 years)		Middle-aged adult (40-59 years)		Young adult (18-39 years)		Middle-aged adult (40-59 years)	
	n	%	n	%	n	%	n	%
Tobacco								
Non-smoker	30	57.70	35	51.50	6	53.55	13	67.80
Light smoker	19	36.50	27	39.70	4	33.95	5	27.20
Moderate smoker	3	5.80	6	8.80	1	12.50	1	5.00
Heavy smoker	0	0.00	0	0.00	0	0.00	0	0.00
Alcohol								
Non-drinker	4	7.69	11	16.20	2	19.65	8	42.80
Occasional drinker	41	78.85	45	66.20	7	66.05	10	52.20
Social drinker	6	11.54	10	14.70	2	14.30	1	5.00
Moderate drinker	1	1.92	2	2.90	0	0.00	0	0.00
Heavy drinker	0	0.00	0	0.00	0	0.00	0	0.00

Table 2. Oral hygiene according to occupational profile and age range among operations workers and administrative employees from a construction company in Lima, Peru, 2021.

Oral hygiene	Operations workers				Administrative employees			
	Young adult[a] (18-39 years)		Middle-aged[b] (40-59 years)		Young adult[a] (18-39 years)		Middle-aged[b] (40-59 years)	
	n	%	n	%	n	%	n	%
Oral hygiene level*								
Good	1	1.90	5	7.30	6	53.55	10	53.35
Fair	38	73.10	49	72.10	5	46.45	8	41.65
Poor	13	25.00	14	20.60	0	0.00	1	5.00
Frequency of oral hygiene								
Never	0	0.00	0	0.00	0	0.00	0	0.00
Once a day	22	42.30	37	54.40	0	0.00	1	5.55
Twice a day	25	48.10	28	41.20	8	67.85	14	73.35
Three or more times a day	5	9.60	3	4.40	3	32.15	4	21.10

* Fisher's exact test.
Statistical significance in oral hygiene level between operations workers and administrative employees: [a] young adults ($p = 0.046$); [b] middle-aged adults ($p = 0.047$).

Operations workers showed a higher prevalence of gingivitis, with an average of 3.04 teeth presenting gingival bleeding and 95.60% (n = 65) of cases in middle-aged adults; and an average of 3.58 and 94.20% (n = 49) in young adults. In contrast, administrative employees showed lower averages of 1.05 and 47.40% (n = 9) in middle-aged adults; and an average of 1.55 and 81.80% (n = 9) in young adults. Periodontitis was also more frequent among operations workers, who had higher mean values for shallow and deep periodontal pockets, respectively: 1.16 and 0.87 in middle-aged adults, with 66.20% (n = 44); and 1.13 and 0.73 in young adults, with 57.70% (n = 30). This contrasts with administrative employees, who showed lower averages for shallow and deep pockets, respectively: 0.84 and 0.16 in middle-aged adults, with 52.60% (n = 10); and 0.73 and 0.18 in young adults, with 36.40% (n = 4). Similarly, clinical attachment loss (CAL) was more severe in operations workers, particularly among young adults, with 25.00% (n = 13) showing mild CAL and 11.50% (n = 6) showing moderate CAL; and among middle-aged adults with 17.65% (n = 12) having mild CAL, 13.24% (n = 9) having moderate CAL, and 5.87% (n = 4) having severe CAL. In contrast, administrative employees showed lower percentages of mild CAL: 18.20% (n = 2) in young adults and 15.80% (n = 3) in middle-aged adults. A statistically significant difference was found between the age groups of operations workers and administrative employees for both gingivitis (p = 0.000 in young adults; p = 0.000 in middle-aged adults) and periodontitis (p = 0.012 in young adults; p = 0.012 in middle-aged adults), indicating that these groups present different levels of periodontal disease (Table 3).

Table 3. Periodontal health according to occupational profile and age group among operations workers and administrative employees from a construction company in Lima, Peru, 2021.

Periodontal health	Operations workers				Administrative employees			
	Young adult[a] (18-39 years)		Middle-aged[b] (40-59 years)		Young adult[a] (18-39 years)		Middle-aged[b] (40-59 years)	
	x̄	SD	x̄	SD	x̄	SD	x̄	SD
Periodontal disease								
Teeth without gingival bleeding	20.90	2.31	21.18	2.21	21.18	2.04	25.47	2.12
Teeth with gingival bleeding	3.58	2.26	3.04	1.68	1.55	0.93	1.05	1.22
Teeth without periodontal pockets	22.75	2.31	22.35	2.35	25.91	2.12	25.63	1.54
Teeth with shallow pockets	1.13	1.27	1.16	1.35	0.73	1.01	0.84	0.83
Teeth with deep pockets	0.73	1.03	0.87	1.30	0.18	0.41	0.16	0.38
	n	%	n	%	n	%	n	%
Gingivitis*								
Individuals without gingivitis	3	5.80	3	4.40	2	18.20	10	52.60
Individuals with gingivitis	49	94.20	65	95.60	9	81.80	9	47.40
Periodontitis*								
Individuals without periodontitis	22	42.30	23	33.80	7	63.60	9	47.40
Individuals with periodontitis	30	57.70	45	66.20	4	36.40	10	52.60
Clinical attachment loss (CAL)								
Individuals without CAL	33	63.50	43	63.24	9	81.80	16	84.20
Individuals with mild CAL	13	25.00	12	17.65	2	18.20	3	15.80
Individuals with moderate CAL	6	11.50	9	13.24	0	0.00	0	0.00
Individuals with severe CAL	0	0.00	4	5.87	0	0.00	0	0.00

* Fisher's exact test.
Statistical significance between occupational profiles with respect to periodontal health (gingivitis: p = 0.000 in young adults[a] and p = 0.000 in middle-aged adults[b]; periodontitis: p = 0.012 in adults[a] and p = 0.0121 in middle-aged adults[b]); x̄: mean; SD: standard deviation.

Finally, regarding intraoral lesions (oral mucosa lesions) and extraoral lesions (orofacial condition) in workers of the construction company, a higher prevalence of intraoral lesions was evidenced in operations workers, with 63.30% (n = 95), compared to 6.00% (n = 9) among administrative employees. The most frequent lesions among operations workers were abscesses, with 34.00% (n = 51), fistulas, with 29.30% (n = 44), and ulcerations, with 23.30% (n = 35). Regarding extraoral lesions, a higher frequency was also observed in operations workers, 55.30% (n = 83), compared to 11.30% (n = 17) in administrative employees, with fissures (22.0%; n = 33), erosions (21.3%; n = 32), and ulcerations (15.3%; n = 23) predominating. No cases of necrotizing periodontal diseases (necrotizing ulcerative gingivitis) or gangrenous stomatitis (noma) were recorded in either group. A statistically significant difference was established between the age groups of the administrative and operations workers for both intraoral lesions (p = 0.013) and extraoral lesions (p = 0.022), suggesting that these groups present different levels of soft tissue involvement (Table 4).

Table 4. Intra- and extraoral lesions according to the occupational profile among operations workers and administrative employees from a construction company in Lima, Peru, 2021.

Lesions	Operations occupational profile*				Administrative occupational profile*			
	With lesions		Without lesions		With lesions		Without lesions	
	n	%	n	%	n	%	n	%
Oral mucosa lesions (intraoral)								
Tumor	1	0.70	119	79.30	0	0.00	30	20.00
Leukoplakia	13	8.70	107	71.30	3	2.00	27	18.00
Lichen planus	4	2.70	116	77.30	1	0.70	29	19.30
Ulceration	35	23.30	85	56.70	4	2.70	26	17.30
Candidiasis	1	0.70	119	80.00	0	0.00	30	20.00
Abscess	51	34.00	69	46.00	2	1.30	28	18.70
Fistula	44	29.30	76	50.80	1	0.70	29	19.30
Orofacial conditions (extraoral)								
Ulceration	23	15.30	97	64.70	5	3.30	25	16.70
Erosions	32	21.30	88	58.70	5	3.30	25	16.70
Fissures	33	22.00	87	58.00	6	4.00	24	16.00
Enlarged lymph nodes	0	0.00	120	80.00	0	0.00	30	20.00
Vesicles	21	14.00	99	66.00	5	3.30	25	16.70
	n		%		n		%	
Frequency of extraoral lesions[a]								
Individuals without extraoral lesions	37		24.60		13		8.80	
Individuals with extraoral lesions	83		55.30		17		11.30	
Frequency of intraoral lesions[b]								
Individuals without intraoral lesions	25		16.70		21		14.00	
Individuals with intraoral lesions	95		63.30		9		6.00	

* Fisher's exact test.
Statistical significance between operations and administrative profiles in: [a] extraoral lesions (p = 0.022) and [b] intraoral lesions (p = 0.013).

DISCUSSION

The results highlight the need to integrate oral health into occupational health policies in Peru. It is essential to consider the social determinants of health, such as educational level, unequal access to oral healthcare services, and specific working conditions that predispose workers to a higher risk of developing periodontal diseases and intra- and extraoral soft tissue lesions. Moreover, based on both the reviewed literature and the present findings, the lack of specific preventive programs in workplace environments contributes to the deterioration of oral health among vulnerable populations across various labor sectors, including construction workers.

Few studies have addressed periodontal health or the frequency of oral lesions among construction workers. However, research in other occupational groups, such as that conducted by Bommireddy et al. (28) on 458 textile mill workers in India, showed that factors such as sex, educational level, occupation type, and harmful habits significantly influence oral health. In their study, women exhibited better oral hygiene than men, and 30.15% of participants presented with significant clinical attachment loss. These findings align with our research, where the operations worker profile—male, with a lower educational level and a higher tobacco and alcohol consumption—was associated with a poorer oral hygiene, a higher prevalence of periodontal diseases, and soft tissue lesions.

Similarly, Baishya et al. (29) reported a prevalence of periodontal disease of 86.27% among 408 brick kiln workers in India, significantly associated with age, poor oral hygiene, and harmful habits. Periodontitis was more common among individuals over 50 years of age who brushed only once a day, used their fingers instead of a toothbrush, and showed high frequencies of alcohol and tobacco consumption. These findings align with our study, where younger operations workers exhibited poorer periodontal indicators compared with administrative employees, highlighting the influence of occupational conditions and habits on oral health.

In addition, Cengiz et al. (30) reported a periodontal disease prevalence of 96.2% among 106 miners in Turkey, influenced by risk factors and hygiene habits. Workers who brushed their teeth daily and had visited the dentist within the previous two years showed better periodontal health. The authors concluded that it was urgent to implement preventive and self-care strategies in this group. These findings, along with those of Baishya et al. (29) and our study, suggest that periodontal-disease prevalence might be related to deficient hygiene practices and, possibly, to prolonged exposure to work shifts that limit the proper frequency and performance of oral hygiene and other occupational risk factors.

Regarding soft tissue lesions, Anzil et al. (31) evaluated 362 fishermen in India and found a 14.9% prevalence of oral mucosal lesions associated with harmful habits such as tobacco, alcohol, and gutka consumption. The most common lesions included ulcerations, leukoplakia, and abscesses. In our study, operations workers showed a much higher prevalence of intraoral (46.7%) and extraoral (39.3%) lesions, with abscesses, ulcerations, fistulas, leukoplakia, fissures, and erosions being the most frequent conditions among the affected population.

Similarly, Bhat et al. (32) assessed 700 cigarette factory workers in India and found that 26.9% presented oral mucosal lesions, including leukoplakia (6.9%), ulcerations (7.6%), and candidiasis (6.0%). These findings, similar to those of our study, suggest that working conditions negatively affect oral health, increasing the risk of oral mucosal pathologies.

Likewise, Pereira et al. (33) analyzed 261 workers in the Indian fishing sector and reported a high prevalence of dental caries and poor oral hygiene, especially among trainee sailors (78.0%). Tormeti et al. (34), in a study conducted in Ghana, also identified poor periodontal status among 276 fishermen, associated with educational and occupational factors. These results are consistent with our findings, highlighting the vulnerability of these occupational groups regarding oral health.

Moreover, Irie et al. (35) reviewed studies in Japan and found that workers with long working hours and night shifts, such as salespeople and drivers, had a higher risk of developing oral diseases. Similarly, Sato et al. (36) and Sato et al. (37) confirmed that poor periodontal status was associated with decreased workplace attendance, emphasizing the relationship between occupational stress and oral health. These findings reinforce the need to address oral health in demanding work environments.

Studies by Jung et al. (38), Patel et al. (39), and Pillai et al. (40), conducted in various groups of workers, also highlight how working conditions affect periodontal health. An increased risk of periodontitis is observed in workers with extended shifts, a high prevalence of caries and poor hygiene in construction migrants, and the presence of periodontal pockets in thermal power plant employees.

These results, comparable to those of our study, underscore the need to integrate oral health into occupational health strategies through specific interventions aimed at improving workers' oral health and occupational safety, with emphasis on operations workers, who are at greater risk of developing oral pathologies. In line with the scientific literature and our comparative findings, it is recommended to incorporate an oral health component into occupational health programs, conside-

ring the characteristics of each occupational profile to improve overall well-being and workers' quality of life.

Among the limitations of the study, the lack of a longitudinal follow-up is highlighted, which would allow the evaluation of the progression of periodontal conditions and soft tissue lesions over time, as well as the impact of possible preventive interventions. Furthermore, being a cross-sectional study in a single company within the construction sector, the findings may not be generalizable to other industries or regions. Another limitation is the lack of control for diet, work stress, and hygiene behaviors outside the workplace, which could influence the results.

CONCLUSIONS

The study provides evidence of poorer periodontal health and soft tissue lesion outcomes in operations workers compared to administrative employees. Both young and middle-aged operations construction workers exhibited worse oral hygiene, gingival bleeding, periodontal pockets, clinical attachment loss, and intra- and extraoral oral conditions than administrative employees.

Conflict of interest:
The authors declare no conflict of interest.

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Author contributions:
CBMC: conceptualization, formal analysis, research, writing – original draft, writing – review & editing.
JEMC: formal analysis, research, validation.
BCCR: examiner team calibration, data curation, validation.
JAMG: conceptualization, formal analysis, data curation, examiner team calibration, validation.

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REFERENCES

1. Decreto Supremo n.° 018-2021-TR, que aprueba la Política Nacional de Seguridad y Salud en el Trabajo al 2030 [Internet]. Lima: Congreso de la República; 2012. Available from: https://busquedas.elperuano.pe/dispositivo/NL/1976342-1
2. Resolución Ministerial n.° 312-2011-MINSA, que aprueba el Documento Técnico «Protocolos de Exámenes Médicos Ocupacionales y Guías de Diagnósticos de los Exámenes Médicos Obligatorios por Actividad» [Internet]. Lima: Ministerio de Salud; 2011. Available from: https://www.gob.pe/institucion/minsa/normas-legales/243792-312-2011-minsa
3. Abbas I, Mohammad SA, Peddireddy PR, Mocherla M, Koppula YR, Avidapu R. Oral health status of underground coal mine workers of Ramakrishnapur, Adilabad district, Telangana, India - A cross-sectional study. J Clin Diagn Res [Internet]. 2016; 10(1): ZC28-ZC31. Available from: https://doi.org/10.7860/jcdr/2016/15777.7059
4. Solanki J, Gupta S, Chand S. Oral health of stone mine workers of Jodhpur City, Rajasthan, India. Saf Health Work [Internet]. 2014; 5(3): 136-139. Available from: https://doi.org/10.1016/j.shaw.2014.05.003
5. Duraiswamy P, Kumar TS, Dagli RJ, Chandrakant, Kulkarni S. Dental caries experience and treatment needs of green marble mine laborers in Udaipur district, Rajasthan, India. Indian J Dent Res [Internet]. 2008; 19(4): 331-334. Available from: https://doi.org/10.4103/0970-9290.44537
6. Kumar S, Tadakamadla J, Tibdewal H, Prabu D, Kulkarni S. Dental prosthetic status and treatment needs of green marble mine laborers, Udaipur, India. Dent Res J [Internet]. 2011; 8(3): 123-127. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC3177386/

7. Rai N, Shyagali TR, Deepak PB, Sexana S. Periodontal health in the marble mining workers of Udaipur City, India. Eur J Pharm Med Res [Internet]. 2016; 3(6): 300-303. Available from: https://www.ejpmr.com/home/abstract_id/1140
8. Araújo ME, Gonini Júnior A. Saúde bucal do trabalhador: Os exames admissional e periódico como um sistema de informação em saúde. Odontol Sociedade. 1999; 1(1-2): 15-18.
9. Hiroishi WK, Orenha ES, Naressi SC. [Labor dentistry: a new perspective on workers' oral health]. Braz Dent Sci [Internet]. 2011; 14(3-4): 66-76. Available from: https://doi.org/10.14295/bds.2011.v14i3/4.782 Portuguese.
10. Rodrigues CK, Ditterich RG, Hebling E. [Legal and ethical aspects of occupational dentistry]. Rev Inst Ciênc Saúde [Internet]. 2007; 25(4): 449-453. Available from: https://repositorio.unip.br/journal-of-the-health-sciences-institute-revista-do-instituto-de-ciencias-da-saude/aspectos-eticos-e-legais-da-odontologia-do-trabalho/ Portuguese.
11. Diacov N, Lima JR. [Dental absenteysm]. Rev Odontol UNESP [Internet]. 1988; 17: 183-189. Available from: https://revodontolunesp.com.br/article/588017467f8c9d0a098b464e Portuguese.
12. Carvalho CM, Coelho MP, Radicchi R. [Dentistry absenteeism in the cooperative of rural producers in Minas Gerais State]. Rev Bras Pesqui Saúde [Internet]. 2007; 9(2): 27-32. Available from: https://periodicos.ufes.br/rbps/article/view/616 Portuguese.
13. Kopias JA. Multidisciplinary model of occupational health services. Medical and non-medical aspects of occupational health. Int J Occup Med Environ Health [Internet]. 2001; 14(1): 23-28. Available from: https://cybra.lodz.pl/dlibra/docconten-t?id=10028
14. Gomero-Cuadra R, Zevallos-Enriques C, Llap Yesan C. [Occupational medicine, occupational and environmental medicine and occupational health]. Rev Méd Hered [Internet]. 2006; 17(2): 105-108. Available from: https://doi.org/10.20453/rmh.v17i2.915 Spanish.
15. Silva E, Martins I, organizadores. Odontologia do trabalho. Construção e conhecimento. São Paulo: Rubio; 2009.
16. Medeiros U. Fundamentos de odontologia do trabalho. São Paulo: Santos; 2011.
17. Mazzilli LE. Odontologia do trabalho. Teoria e prática. 3th ed. São Paulo: Santos; 2013.
18. Mello PB. Odontologia do trabalho. Uma visão multidisciplinar. 2nd ed. São Paulo: Rubio; 2014.
19. Duque A. [Chronic periodontitis in Latin America]. Rev Clin Periodoncia Implantol Rehabil Oral [Internet]. 2016; 9(2): 208-215. Available from: http://dx.doi.org/10.1016/j.piro.2016.07.005 Spanish.
20. World Health Organization. Oral health surveys: basic methods. Ginebra: WHO; 1971.
21. World Health Organization. Oral health surveys: basic methods. 2nd ed. Ginebra: WHO; 1977.
22. World Health Organization. Oral Health Surveys: Basic Methods. 3rd ed. Ginebra: WHO; 1987.
23. World Health Organization. Oral Health Surveys: Basic Methods. 4th ed. Ginebra: WHO; 1997. Available from: https://iris.who.int/bitstream/handle/10665/41905/9241544937.pdf?sequence=1
24. World Health Organization. Oral Health Surveys: Basic Methods [Internet]. 5th ed. Ginebra: WHO; 2013. Available from: https://www.who.int/publications/i/item/9789241548649
25. Ainamo J, Barmes D, Beagrie G, Cutress T, Martin J, Sardo-Infirri J. Development of the World Health Organization (WHO) Community Periodontal Index of Treatment Needs (CPITN). Int Dent J [Internet]. 1982; 32: 281-291. Available from: https://pubmed.ncbi.nlm.nih.gov/6958657/
26. Greene JC, Vermillion JR. Oral hygiene index: a method for classifying oral hygiene status. J Am Dent Assoc [Internet]. 1960; 61(2): 172-179. Available from: https://doi.org/10.14219/jada.archive.1960.0177
27. Greene JC, Vermillion JR. The simplified oral hygiene index. J Am Dent Assoc [Internet]. 1964; 68(1): 7-13. Available from: https://doi.org/10.14219/jada.archive.1964.0034
28. Bommireddy VS, Gayathri Naidu SS, Kondapalli TP, Kommineni HC, Madem R, Padagala GM. Oral hygiene habits, oral health status, and oral health care seeking behaviors among spinning mill workers in Guntur district: a cross-sectional study. J Family Med Prim Care [Internet]. 2020; 9(6): 3025-3029. Available from: https://doi.org/10.4103/jfmpc.jfmpc_349_20
29. Baishya B, Satpathy A, Nayak R, Mohanty R. Oral hygiene status, oral hygiene practices and periodontal health of brick kiln workers of Odisha. J Indian Soc Periodontol [Internet]. 2019; 23(2): 163-167. Available from: https://doi.org/10.4103/jisp.jisp_383_18
30. Cengiz MI, Zengin B, İçen M, Köktürk F. Prevalence of periodontal disease among mine workers of Zonguldak, Kozlu district, Turkey: a cross-sectional study. BMC Public Health [Internet]. 2018; 18: 361-367. Available from: https://doi.org/10.1186/s12889-018-5304-1
31. Anzil KS, Mathews J, Sai AG, Kiran M, Kevin S, Sunith S. Prevalence of deleterious oral habits and oral mucosal lesions among fishermen population of Mahe, South India. J Contemp Dent Pract [Internet]. 2016; 17(9): 745-749. Available from: https://doi.org/10.5005/jp-journals-10024-1923
32. Bhat PK, Kumar A, Aruna CN, Badiyani BK, Jayachandra MY. Assessment of oral mucosal conditions among beedi workers residing in beedi workers colonies in Karnataka, India. J Oral Maxillofac

Pathol [Internet]. 2018; 22(3): 298-302. Available from: https://doi.org/10.4103/jomfp.jomfp_140_18
33. Pereira CR, Jalihal S, Ankola AV, Dias FM, Pai Khot AJ, Thakker J. Prevalence of dental caries, oral hygiene status and treatment needs among seafarers and trainee sailors in the state of Goa, India: a descriptive cross-sectional study. Int Marit Health [Internet]. 2023; 74(2): 105-111. Available from: https://doi.org/10.5603/imh.2023.0016
34. Tormeti D, Nii-Aponsah H, Sackeyfio J, Blankson PK, Quartey-Papafio N, Arthur M, et al. Periodontal status and oral hygiene practices among adults in a peri-urban fishing community in Ghana. Pan Afr Med J [Internet]. 2022; 42: 126. Available from: https://doi.org/10.11604/pamj.2022.42.126.24557
35. Irie K, Tsuneishi M, Saijo M, Suzuki C, Yamamoto T. Occupational difference in oral health status and behaviors in Japanese workers: a literature review. Int J Environ Res Public Health [Internet]. 2022; 19(13): 8081. Available from: https://doi.org/10.3390/ijerph19138081
36. Sato Y, Yoshioka E, Takekawa M, Saijo Y. Cross-sectional associations between oral diseases and work productivity loss among regular employees in Japan. Ind Health [Internet]. 2023; 61(1): 3-13. Available from: https://doi.org/10.2486/indhealth.2021-0274
37. Sato Y, Yoshioka E, Takekawa M, Saijo Y. Cross-sectional associations between effort-reward imbalance at work and oral diseases in Japan. PeerJ [Internet]. 2022; 10: e13792. Available from: https://doi.org/10.7717/peerj.13792
38. Jung SK, Lim HK, Jeong Y, Lee SJ, Park JS, Song IS. Influence of shift work on periodontitis according to the occupation group. Sci Rep [Internet]. 2023; 13(1): 17921. Available from: https://doi.org/10.1038/s41598-023-45222-z
39. Patel AS, Jalihal S, Ankola AV, Santhosh VN, Ragu K, Thakker J, et al. Dental caries, oral hygiene status and deleterious habits among migrant construction workers of Belagavi, India. J Prev Med Hyg [Internet]. 2024; 65(1): E65-E72. Available from: https://doi.org/10.15167/2421-4248/jpmh2024.65.1.3150
40. Pillai DD, Palaneeswaran K, Sivalingam B, Annamalai I, Shobana G, Aziz MB, et al. Prevalence of periodontitis among thermal power station workers in South India. J Pharm Bioallied Sci [Internet]. 2024; 16(Suppl 2): S1393-S1395. Available from: https://doi.org/10.4103/jpbs.jpbs_716_23