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Prevalence of musculoskeletal disorders among members of the Peruvian Society of Endodontics*

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ABSTRACT

Objective: To identify the prevalence of musculoskeletal disorders (MSDs) among members of the Peruvian Society of Endodontics. **Materials and methods:** The Kuorinka Nordic Musculoskeletal Questionnaire was distributed to members of the society and administered online via Google Forms. Of the responses received, 135 that met the inclusion criteria were analyzed. **Results:** 66.67% of respondents reported the neck as the area most affected by musculoskeletal disorders (MSDs), with 62.22% reporting this discomfort in the same area during the past week. In contrast, the elbow and forearm showed the least involvement, with a prevalence of 14.07% in the overall analysis, which decreased to 13.33% in the last 12 months and to 6.67% during the past week. Binary logistic regression analysis showed that gender was a significant predictor of MSDs in the neck (OR = 6.01; $p < 0.001$) and shoulder (OR = 2.99; $p = 0.004$), with a higher probability in women. In the wrist and hand, age was significant (OR = 0.26; $p = 0.033$), indicating a lower risk with increasing age. No statistically significant associations were observed in the elbow/forearm and thoracic/lumbar segments. **Conclusions:** The neck area was the most affected by musculoskeletal disorders (MSDs), followed by the thoracic or lumbar region, the shoulders, and the wrists or hands, in that order. However, this severity decreased in all areas during the last seven days. Furthermore, the elbow and forearm were the least affected areas due to their lower exposure to overload or repetitive movements.

Keywords: prevalence; musculoskeletal diseases; musculoskeletal pain; dentists.

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INTRODUCTION

In recent years, an increase in musculoskeletal disorders (MSDs) has been observed. These conditions are defined as physical alterations affecting the musculoskeletal system, including ligaments, muscles, tendons, nerves, and joints (1). Such injuries often originate from or are exacerbated by occupational activities and the conditions under which work is performed, making them one of the leading causes of disability worldwide. MSDs generate pain—particularly in the back and extremities—reduce productivity, and entail significant economic consequences due to medical expenses and workers' compensation costs (2).

Various occupational factors contribute to their development, including inadequate or repetitive postures, forceful hand movements, poorly designed equipment, confined workspaces, and non-ergonomic work patterns (3). The Global Burden of Disease 2019 identified MSDs as the leading cause of rehabilitation needs, with an estimated prevalence of 1.71 billion people, with low back pain being the most common condition in 134 of the 204 countries evaluated (4). In professions such as dentistry, more than 90% of professionals experience work-related MSDs (5).

Dental practice—and endodontics in particular—involves specific risk factors (6). The confined working space, limited visualization of the oral cavity, and limited incorporation of supportive technology promote the adoption of forced and prolonged postures (7). In addition, the frequent use of microscopes, rotary instruments, and ultrasonic devices, along with repetitive movements, increases the likelihood of developing MSDs (8). Studies indicate that endodontists, compared with other dental specialists, are exposed to these risk factors to a greater extent due to the specific characteristics of their clinical practice (9). A study conducted in Colombia reported that the most frequently affected anatomical regions among these professionals were the lower back and neck, accounting for 30% of cases (8). In Peru, no studies have been identified that determine the prevalence and anatomical distribution of MSDs among endodontic specialists, highlighting a clear need for research in this area.

This study is justified by the high prevalence of MSDs among dental professionals, particularly endodontic specialists, who are continuously exposed to repetitive task performance and unfavorable ergonomic conditions inherent to their practice (10). This situation not only affects their physical health but also compromises work performance, increases the risk of absenteeism, and may shorten their active professional lifespan.

The objective of this study was to identify the prevalence of MSDs among members of the Peruvian Society of Endodontics by age group and sex, and to assess the evolution, duration, limitation, treatment, and pain intensity associated with this condition.

MATERIALS AND METHODS

An analytical, cross-sectional study was conducted, as the questionnaire was administered at a single point in time. In addition, the study had a retrospective design, as it collected information based on the background information provided by participants.

The study population consisted of members of the Peruvian Society of Endodontics belonging to its only branches: Junín, Cusco, Ica, Lambayeque, Trujillo, Tacna, and Lima, which in May 2024 had a total of 550 members. Sample size estimation was performed using the statistical software Epidat version 3.1, selecting the option for confidence interval calculation for proportions. An expected proportion of 86.7% (corresponding to the pilot test), a confidence level of 95%, and an absolute precision of 5% were used. Non-probability convenience sampling was applied. Inclusion criteria comprised professionals who performed at least 4 hours of clinical practice per day and were younger than 60 years. Exclusion criteria included individuals engaged exclusively in administrative duties, those who were pregnant, those who had undergone surgery of the upper limbs or spine within the previous 12 months, those diagnosed with osteoarthritis in the evaluated anatomical regions, and those with a psychiatric diagnosis of stress, anxiety, or depression. Of the 139 responses obtained, 4 were excluded for not meeting the eligibility criteria, resulting in a final sample of 135 participants.

The primary variable was the presence of MSDs, along with sex and age. According to the Kuorinka Nordic Musculoskeletal Questionnaire, MSD presence was defined as the identification of symptoms that may originate from or be aggravated by occupational activity and working conditions. This variable was treated as a dichotomous nominal categorical variable (yes/no). Descriptive dimensions of this variable included the anatomical regions evaluated, reference periods, duration of symptoms, functional limitation, episode duration, and pain intensity.

The instrument used was the Kuorinka Nordic Musculoskeletal Questionnaire, a standardized and widely used tool for assessing musculoskeletal symptoms across multiple anatomical regions, particularly recognized in occupational health and epidemiological research (11). Its structure allows for the identification of the presence, location, and duration of MSDs in areas such as the neck, shoulders, elbows, wrists/hands, upper back, lower back, hips/thighs, knees, and ankles/feet. Information is obtained based on

discomfort reported by participants during two periods: the previous 12 months and the previous 7 days.

This questionnaire has demonstrated adequate psychometric properties, including test–retest reliability (12), with kappa values ranging from 0.51 to 0.90 across various national and international validations, as well as high internal consistency (Cronbach's α up to 0.896; KR20 = 0.737-0.873) (13). These values support the stability and homogeneity of its items. In addition, it exhibits construct validity by discriminating between individuals with and without musculoskeletal problems, and criterion validity, evidenced by good agreement with clinical records (kappa = 0.76) (14). Furthermore, the questionnaire is feasible for population-based studies, as it requires a short completion time (≈6 minutes) and has high participant acceptance.

The questionnaire was adapted for virtual administration using the Google Forms platform. A digital informed consent form was included at the beginning to ensure that participants understood the study objectives, the confidentiality of the information, and the voluntary nature of their participation. The link generated (https://forms.gle/kisvVxc88Grqf6as5) was distributed by e-mail and via telephone numbers of the members of the Peruvian Society of Endodontics from the selected branches. A 45-day data collection period was established after distribution, until the required sample size was reached.

Data analysis was performed using SPSS software, version 27. Initially, descriptive statistics were applied using frequencies and summary measures to describe the prevalence of MSDs by body segment, age group, and sex. Similarly, body regions with the highest frequency of symptoms across different time periods were identified, as well as symptom duration, functional limitation, episode length, treatment prevalence, and reported pain intensity.

Subsequently, multivariate binary logistic regression was used to determine the association between the independent variables (age and sex) and the presence of MSDs in different anatomical regions. Results were expressed as odds ratios (ORs) with 95% confidence intervals. This measure of association was selected because logistic regression appropriately models dichotomous dependent variables (presence/absence of MSDs), even in scenarios with high prevalence, and provides greater robustness in estimation by simultaneously controlling multiple independent variables (15). Moreover, its use is widely recommended in cross-sectional epidemiological studies aimed at exploring adjusted associations between risk factors and health outcomes.

This study was approved by the Ethics Committee of the Universidad Privada de Tacna (registration number 082-05-2024). In addition, the study complied with the provisions of Law No. 30948, the Law for the Promotion of Scientific Researcher Development, ensuring participant anonymity throughout the research process.

RESULTS

The analysis identified the body segments with the highest prevalence of MSDs across different reference periods. The neck had the highest prevalence of MSDs, with 66.67% (n = 90) overall, which decreased to 62.22% (n = 84) during the last week. In contrast, the elbow or forearm showed the lowest prevalence, with 14.07% (n = 19) in the overall analysis, decreasing to 13.33% (n = 18) over the previous 12 months and to 6.67% (n = 9) during the last week (Figure 1).

The analysis presented in Figure 2 shows variations in MSD prevalence according to body segment and age group. In the neck, the highest prevalence was observed in the 32–38 age group, with 35.56% (n = 48), whereas a marked decrease was observed in the 53–60 age group, with 6.67% (n = 9). In the shoulders, the 39-45 age group had the highest prevalence, with 30.30% (n = 41), gradually decreasing to 6.06% (n = 8) in the 53-60 age group. In the elbow or forearm, the highest prevalences were observed in the 32–38 and 39–45 age groups, each with 31.58% (n = 43). In contrast, the 46–52 and 53–60 age groups showed lower values, with 10.53% (n = 14). In the wrists or hands, the 32–38 age group showed the greatest involvement, reaching 28.07% (n = 38), with a significant reduction in the 53–60 age group (5.26%; n = 7). Finally, the dorsal or lumbar region followed a similar pattern, with high prevalences in the 32–38 age group (37.50%; n = 51) and a significant decrease in the 53–60 age group (9.38%; n = 13).

Regarding prevalence by sex, the analysis showed that women presented a higher frequency of MSDs in the neck, with 56.67% (n = 77), compared with men, who accounted for 43.33% (n = 58). This trend was observed in the shoulders, where women reported a prevalence of 56.06% (n = 76) and men 43.94% (n = 59). In the elbow or forearm segment, prevalence was 52.63% in women (n = 71) and 47.37% in men (n = 64). In the wrist or hand region, men showed a slightly higher prevalence (50.88%; n = 69) compared with women (49.12%; n = 66). In the dorsal or lumbar region, women showed a higher prevalence, with 51.56% (n = 70), compared with 48.44% (n = 65) in men (Figure 3).

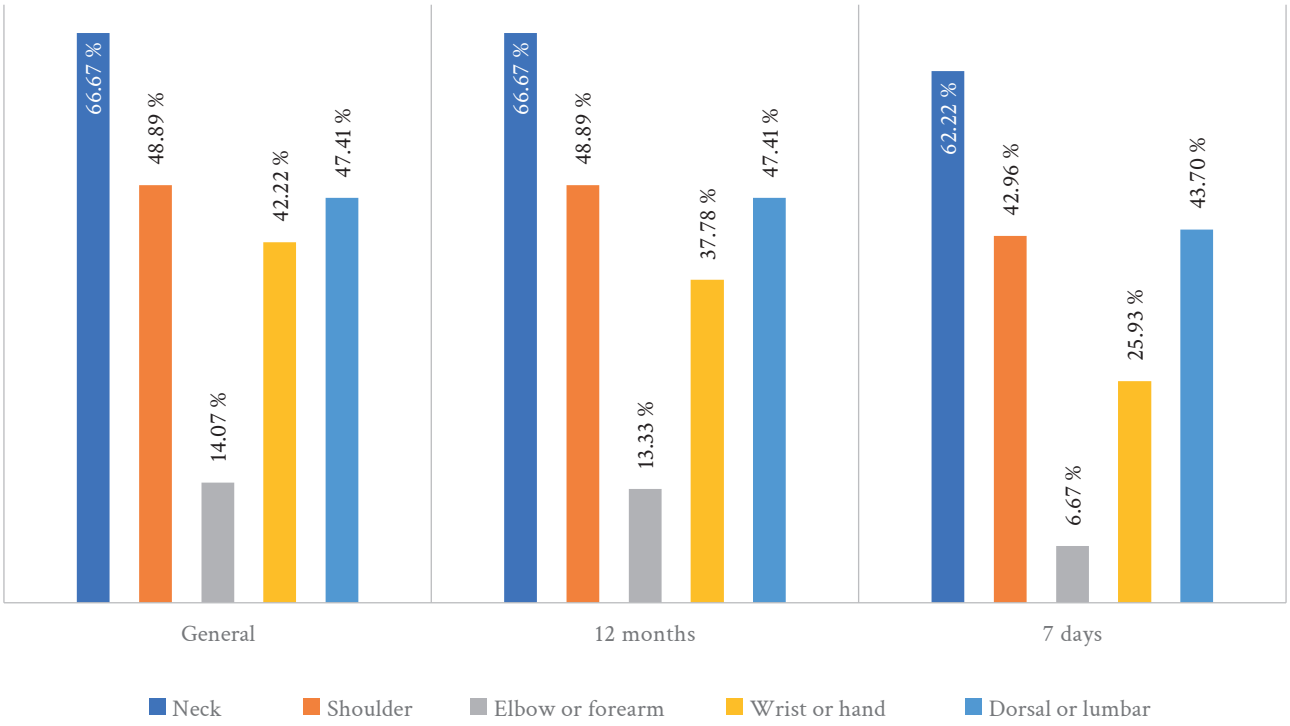

Figure 1. Prevalence of musculoskeletal disorders.

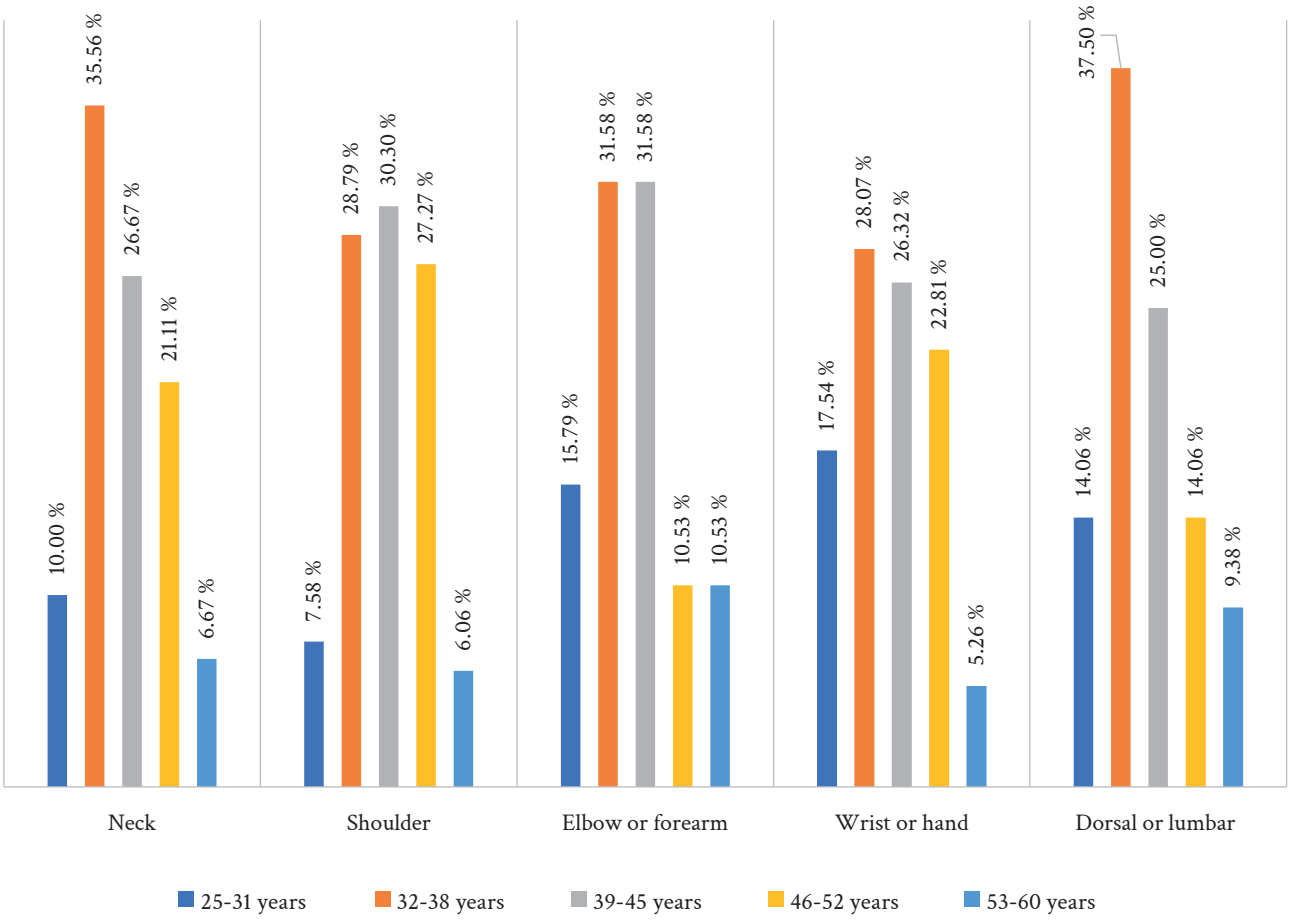

Figure 2. Prevalence of musculoskeletal disorders by age group.

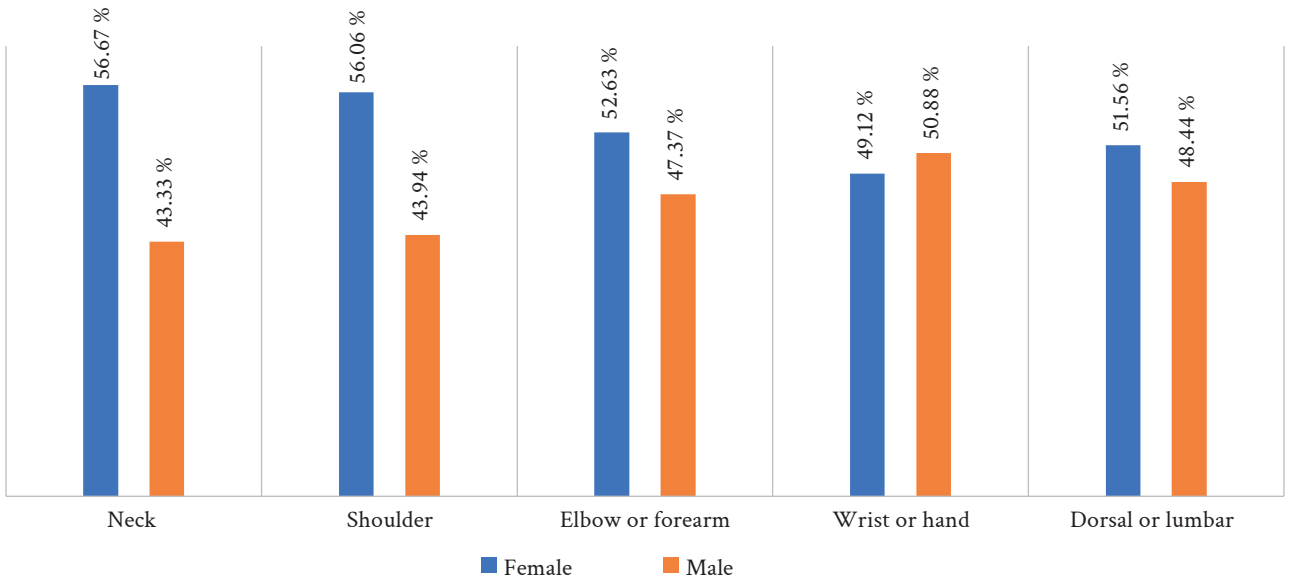

Figure 3. Prevalence of musculoskeletal disorders by sex.

The analysis in Table 1 indicates that most participants reported greater than 3-month progression in several segments, with percentages close to or exceeding 40%. Periods of less than 1 month and between 1 and 3 months showed more variable, though still relevant, distributions. Meanwhile, Table 2 shows that most episodes were of short duration, predominantly lasting less than 1 hour or between 1 and 24 hours.

Table 1. Duration of musculoskeletal disorders.

Segment	Duration	n	%
Neck	<1 month	33	36.67
	>3 months	26	28.89
	1-3 months	31	34.44
Shoulder	<1 month	19	28.79
	>3 months	18	27.27
	1-3 months	29	43.94
Elbow or forearm	<1 month	5	26.32
	>3 months	9	47.37
	1-3 months	5	26.32
Wrist or hand	<1 month	16	28.07
	>3 months	23	40.35
	1-3 months	18	31.58
Dorsal or lumbar region	<1 month	21	32.81
	>3 months	27	42.19
	1-3 months	16	25.00

Table 2. Duration of musculoskeletal disorder episodes.

Segment	Episode duration	n	%
Neck	<1 hour	39	43.33
	1- 24 hours	39	43.33
	1-7 days	8	8.89
	1-4 weeks	1	1.11
	> 1 month	3	3.33
Shoulder	<1 hour	23	34.85
	1- 24 hours	33	50.00
	1-7 days	7	10.61
	1-4 weeks	2	3.03
	>1 month	1	1.52
Elbow or forearm	<1 hour	7	38.89
	1-24 hours	6	33.33
	1-7 days	4	22.22
	>1 month	1	5.56
Wrist or hand	<1 hour	17	33.33
	1-24 hours	22	43.14
	1-7 days	11	21.57
	>1 month	1	1.96
Dorsal or lumbar region	<1 hour	23	35.94
	1-24 hours	21	32.81
	1-7 days	11	17.19
	1-4 weeks	5	7.81
	>1 month	4	6.25

In Table 3, it was observed that in most cases there was no limitation of daily activities (0 days), or the limitations were of short duration, lasting between 1 and 7 days. In Table 4, most segments showed that the reported MSDs required some type of intervention, exceeding 50% of cases. The only segment with a lower percentage of received care was the elbow or forearm. Finally, Table 5 shows that the neck presented the highest pain level, with a mean score of 2.1 (95% CI: 1.86–2.44). In contrast, the wrist or hand and elbow or forearm recorded the lowest values, with averages of 1.16 (95% CI: 0,87-1,43) and 0,49 (95% CI: 0,30-0,68), respectively.

In Table 6, the binary logistic regression analysis assessing the association between age and sex with the presence of MSDs across different body segments is presented. In the neck segment, sex showed a positive and statistically significant association with the presence of MSDs (OR = 6.01; 95% CI: 2.548–14.918; $p < 0.001$), whereas age did not show a significant association (OR = 1.33; $p = 0.674$). In the shoulder segment, sex demonstrated a positive and statistically significant association (OR = 2.99; 95% CI: 1.556–6.848; $p = 0.004$), while age was not significantly associated (OR = 1.26; $p = 0.726$). In the elbow or forearm segment, neither age (OR = 0.56; $p = 0.464$) nor sex (OR = 1.75; $p = 0.286$) showed statistically significant associations with the presence of MSDs. In the wrist or hand segment, age showed a negative and statistically significant association (OR = 0.26; 95% CI: 0.170–0.535; $p = 0.033$), whereas sex did not present a significant association (OR = 1.49; $p = 0.284$). Finally, in the dorsal or lumbar segment, neither age (OR = 0.68; $p = 0.529$) nor sex (OR = 2.00; $p = 0.062$) reached statistical significance.

Table 3. Limitation period due to musculoskeletal disorders.

Segment	Duration of limitation	n	%
Neck	0 days	36	40.00
	1-7 days	46	51.11
	1-4 weeks	6	6.67
	>1 month	2	2.22
Shoulder	0 days	31	46.97
	1-7 days	31	46.97
	1-4 weeks	2	3.03
	>1 month	2	3.03
Elbow or forearm	0 days	10	55.56
	1-7 days	8	44.44
Wrist or hand	0 days	22	43.14
	1-7 days	28	54.90
	1-4 weeks	1	1.96
Dorsal or lumbar region	0 days	23	35.94
	1-7 days	38	59.38
	1-4 weeks	3	4.69

Table 4. Prevalence of treatment for musculoskeletal disorders.

Segment	n	%
Neck	52	57.78
Shoulder	35	53.03
Elbow or forearm	6	33.33
Wrist or hand	28	54.90
Dorsal or lumbar region	39	60.94

Table 5. Pain level in musculoskeletal disorders.

	Mean	95% CI	SD	Min.	Max.
Neck	2.15	1.86-2.44	1.69	0	5
Shoulder	1.61	1.31-1.91	1.75	0	5
Elbow or forearm	0489	0301-0677	1.11	0	5
Wrist or hand	1.16	0877-1.43	1.64	0	5
Dorsal or lumbar region	1.48	1.2-1.76	1.65	0	5

SD: Standard deviation.

Table 6. Binary logistic regression.

Segment	Predictor variable	OR	95% CI	p
Neck	Age (years)	1.33	0943-1546	0674
	Sex (F vs. M)	6.01	2548-14918	<0.001
Shoulder	Age (years)	1.26	0901-1458	0726
	Sex (F vs. M)	2.99	1556-6848	0004
Elbow or forearm	Age (years)	0.56	0347-1088	0464
	Sex (F vs. M)	1.75	0545-3929	0286
Wrist or hand	Age (years)	0.26	0170-0535	0033
	Sex (F vs. M)	1.49	0640-2650	0284
Dorsal or lumbar region	Age (years)	0.68	0149-1552	0529
	Sex (F vs. M)	2.00	0786-3249	0062

F: female; M: male.

DISCUSSION

Inadequate postures, repetitive movements, and fatigue in the workplace constitute frequent risk factors for the development of occupational problems. Among these, MSDs represent one of the main contributors to occupational disease burden and are closely associated with ergonomic factors present in the work environment (16). The World Health Organization recognizes these conditions as one of the most common causes of disability and functional limitation in the population (17).

In this study, the body segments most frequently affected were the cervical region, dorsal/lumbar region, shoulders, and wrists/hands. This pattern is consistent with findings reported in other studies conducted among dental professionals and students (18,19). These results reinforce the hypothesis that conditions inherent to clinical dental practice—such as prolonged maintenance of static postures and the performance of repetitive movements—favor the development of these disorders.

In this regard, Miranda (18) identified the neck as the most affected region among dental students, followed by the lumbar area. Conversely, Alzayani et al. (19) reported a high incidence of MSDs in the neck, shoulders, and lumbar region among the dental personnel, which can be explained by exposure to common ergonomic risk factors in dental practice.

AlSahiem et al. (9) found that regular physical activity (walking, exercise, yoga) is associated with a lower risk of developing MSDs, highlighting the importance of promoting healthy habits as a preventive strategy. Similarly, Hashim et al. (20) emphasized physical inactivity as a determining factor in the onset of these disorders.

Furthermore, prolonged professional experience and extended working hours have been identified as factors that increase the risk of developing these conditions. Alzayani et al. (19) reported a higher prevalence among individuals with more than five years of professional practice or those working more than 12 hours per day, while Castro (21) found an elevated risk among professionals working between 9 and 12 hours a day. These findings are consistent with international literature and suggest that prolonged occupational overexposure constitutes a determining factor in the development of MSDs.

The high prevalence of cervical involvement represents a relevant finding, as over time it may lead to functional limitations, reduced work capacity, and an increased risk of absenteeism, affecting both the health of professionals and the quality of care provided to patients. Therefore, it is essential to implement periodic musculoskeletal examinations, postural correction strategies, active breaks, and ergonomic adaptations of work equipment to mitigate the impact of these disorders and extend the active working life of specialists.

Regarding segmental distribution, the pattern identified in this study aligns with that reported by Bhatia et al. (1), who described greater discomfort in the neck, lumbar region, and upper extremities among dentists, particularly in the hands and wrists. These findings reinforce the notion that the upper extremities are especially vulnerable to overload and repetitive movements inherent to dental practice.

Conversely, the elbow or forearm showed considerably lower involvement compared to other regions, suggesting that these areas are less exposed to repetitive strain during clinical activity. In this context, Castro (21) confirms that the neck and lumbar region remain the

segments most frequently affected, which is attributed to prolonged postures and insufficient ergonomics in the dental work environment.

When analyzing prevalence by age groups, a greater impact was observed among middle-aged adults, particularly those aged 32–38 and 39–45. This trend may be related to the accumulation of years of professional practice, higher patient workloads during this stage, and continuous exposure to static postures and repetitive movements. In contrast, older age groups showed a lower frequency of symptoms, possibly associated with reduced workload, postural adaptation acquired through experience, or discontinuation of clinical practice in cases of severe symptomatology.

Overall, the results suggest that MSDs among dentists are more frequent in the neck, shoulders, and lumbar region, with a greater impact among middle-aged professionals. This highlights the need for early preventive interventions and ergonomics programs targeted at this group.

It has been suggested that the higher prevalence among women may be related to differences in physical load distribution and hormonal factors. Additionally, the persistence of symptoms is often associated with the absence of adequate preventive measures. In this regard, ergonomic interventions are particularly relevant for prevention, especially in the hands and wrists, where they have been shown to reduce the need for medical care (11). In our study, a higher prevalence of discomfort was observed among women compared to men in the cervical segment, which is consistent with findings reported by Cabezas-García et al. (3). However, these findings contrast with those reported by AlSahiem et al. (9) and Castro (21), who found that men were more likely to experience these disorders. Such discrepancies may be attributed to methodological differences, sample size, and sample composition across studies.

Regarding the duration of pain episodes, most were found to be brief, with a predominance of short-duration episodes, while prolonged episodes were less frequent. This suggests that, in most cases, musculoskeletal symptoms among dentists present intermittently and are self-limiting.

In terms of functional impact, most participants reported no limitation in daily activities or only short-term limitations, indicating that acute episodes are the most common. Nevertheless, more than half of the cases required some form of intervention, highlighting the clinical relevance of these conditions. It should be mentioned that the elbow or forearm was the segment that least frequently required medical attention.

The segments with the highest overall prevalence of MSDs were the neck, dorsal/lumbar region, and shoulders, with a tendency toward symptom reduction during the last seven days. This decrease may be explained by symptom fluctuation depending on recent workload, as well as the subjective perception of pain, which tends to vary according to the intensity of activities performed.

Having specific data on the prevalence and localization of these disorders among endodontists will allow the development of evidence-based preventive and corrective strategies, optimizing ergonomics in clinical practice. This approach aims to promote balanced musculoskeletal health, improve specialists' quality of life, and extend their professional careers, while reducing the incidence of occupational disorders and associated healthcare costs.

This study has some limitations that should be considered when interpreting the results. The virtual administration of the questionnaire may have limited participation among individuals with less access to or familiarity with digital tools. Additionally, the sample consisted exclusively of members of the Peruvian Society of Endodontics, which limits the generalizability of the findings to other professional groups.

CONCLUSIONS

Regarding the affected body segments, the neck showed the highest prevalence, indicating greater vulnerability to MSDs. This was followed, in decreasing order of frequency, by the dorsal or lumbar region, the shoulders, and the wrists or hands. However, prevalence rates decreased across all segments during the last seven days, which may reflect the variable nature of symptoms, as they tend to fluctuate or improve over time. It should be mentioned that the elbow and forearm exhibited the lowest prevalence rates, suggesting that these areas are less exposed to overload or sustained biomechanical demands compared to other anatomical regions.

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Authorship contribution:
MEGDR: conceptualization, methodology, writing of the original draft.
MILG: research, visualization.
MGCG: research, writing – review & editing.
SFPT: research, writing – review & editing.

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