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Assessment of functional disability caused by low back pain in primary care dentists

Avaliação da incapacidade funcional causada por dor lombar em dentistas da atenção primária

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ABSTRACT

BACKGROUND AND OBJECTIVES: Dentists are frequently exposed to ergonomic occupational risks, such as incorrect posture and repetitive movements, which contribute to musculoskeletal disorders, including low back pain. The objective of this study was to assess the prevalence of low back pain (LBP) and disability among Primary Health Care (PHC) dentists in the northern macro-region of the Minas Gerais state, Brazil.

METHODS: A cross-sectional design was adopted with convenience sampling. Data was collected via an online questionnaire from dentists in 54 municipalities within the Regional Health Superintendence of Montes Claros city between March and June 2022. The Oswestry Disability Index 2.0 measured disability due to LBP. Statistical analyses included Pearson's Chi-square test and Poisson regression.

RESULTS: Among the 298 participants, the majority were women (79.2%). LBP was reported by 63.4% of the dentists, with 12.8% experiencing associated disability. In the final regression model, disability was significantly linked to female gender (PR 2.81; CI 95% 1.13-7.01), overweight body mass index (PR 1.72; CI 95% 1.01-2.96), self-reported LBP (PR 2.34; CI 95% 1.12-4.87), work-related pain (PR 3.86; CI 95% 1.23-12.13), and sick leave due to LBP (PR 5.28; CI 95% 2.29-12.18).

CONCLUSION: This study revealed a high prevalence of LBP among primary care dentists in the northern macro-region of Minas Gerais state, with a notable proportion experiencing associated disability. These findings underscore the need for targeted ergonomic interventions and health promotion strategies to mitigate LBP and its impact on dental professionals.

KEYWORDS: Primary health care, Low back pain, Dentistry, Occupational risks, Occupational health.

RESUMO

JUSTIFICATIVA E OBJETIVOS: Dentistas estão frequentemente expostos a riscos ocupacionais ergonômicos, como postura incorreta e movimentos repetitivos, que contribuem para distúrbios musculoesqueléticos, incluindo a dor lombar (DL). O objetivo deste estudo foi avaliar a prevalência de DL e incapacidade entre dentistas da Atenção Primária à Saúde (APS) na macrorregião Norte do estado de Minas Gerais.

MÉTODOS: Foi adotado um desenho transversal com amostragem por conveniência. Os dados foram coletados por meio de um questionário online com dentistas de 54 municípios pertencentes à Superintendência Regional de Saúde de Montes Claros, entre março e junho de 2022. O Índice de Oswestry 2.0 foi utilizado para medir a incapacidade devido à DL. As análises estatísticas incluíram o teste Qui-quadrado de Pearson e a regressão de Poisson.

RESULTADOS: Entre os 298 participantes, a maioria era mulher (79,2%). A DL foi relatada por 63,4% dos dentistas, com 12,8% apresentando incapacidade associada. No modelo final de regressão, a incapacidade foi significativamente associada ao sexo feminino (RP 2,81; IC 95% 1,13-7,01), ao índice de massa corporal elevado (RP 1,72; IC 95% 1,01-2,96), à DL autorrelatada (RP 2,34; IC 95% 1,12-4,87), à dor relacionada ao trabalho (RP 3,86; IC 95% 1,23-12,13) e à licença médica por DL (RP 5,28; IC 95% 2,29-12,18).

CONCLUSÃO: Este estudo revelou alta prevalência de DL entre os dentistas da APS na macrorregião norte de Minas Gerais, com uma proporção notável de casos com incapacidade associada. Esses achados destacam a necessidade de intervenções ergonômicas direcionadas e estratégias de promoção da saúde para mitigar a DL e seu impacto nos profissionais de odontologia.

DESCRITORES: Atenção primária à saúde, Dor lombar, Odontologia, Riscos ocupacionais, Saúde do Trabalhador.

HIGHLIGHTS

- 63.4% of primary care dentists reported low back pain; 12.8% had disability
- Female gender, body mass index, and work pain linked to disability among dentists
- This study stresses preventive measures for dentists' occupational health issues

INTRODUCTION

In clinical practice, dentists are exposed to a wide spectrum of occupational risks, with ergonomic risks being particularly prominent[1,2]. Ergonomic occupational risks arise from factors such as incorrect posture, absence of auxiliary professionals, lack of training and attention, inadequate planning, excessive rhythm of work, repetitive movements, and the use of rotating instruments, among others[3-5]. These risks can lead to the development of musculoskeletal disorders (MD)[6,7].

MD are conditions that affect structures within the musculoskeletal system, including muscles, bones, joints, tendons and ligaments. These disorders involve conditions such as fibromyalgia, rheumatic diseases, repetitive stress injury, traumatic injuries and back pain[8]. Among MD, low back pain (LBP) is a highly prevalent condition in the general population, representing the leading cause of years lived with disability[9,10].

LBP was responsible for nearly 54% of the increase in years lived with disability from 1990 to 2015[10]. A study that analyzed data from 195 countries in the period from 1990 to 2016[9] showed that LBP lost only to ischemic heart diseases, and along with cervicalgia and brain diseases, was the disease that caused most of most years lived with disability. LBP is a complex symptom that may be associated with physical, social, psychological and lifestyle factors, such as sedentary lifestyle, obesity and smoking. In addition to being highly disabling, LBP significantly reduces productivity at work and the quality of life (QoL) of affected individuals[3,10].

Several studies have evaluated the prevalence of musculoskeletal pain among dentists worldwide, consistently identifying LBP as the most common issue during their work routines. Ergonomic factors in dental clinics play a significant role in the development of LBP among dentists, primarily due to prolonged awkward postures, repetitive movements, and insufficient breaks during work hours. Dentists often adopt static positions for extended periods, combined with frequent twisting of the spine and rotation of the head, which leads to muscle fatigue and strain. These physical demands are exacerbated by the repetitive use of hand and arm movements required for dental procedures, resulting in cumulative trauma to the musculoskeletal system.

The absence of adequate breaks further increases the risk of LBP, as prolonged work without rest does not allow sufficient recovery time for the muscles. Despite the focus on workplace ergonomics, individual factors such as physical fitness, lifestyle, and health habits also significantly influence the likelihood of developing LBP[11-18].

In Brazil, the scenario is consistent with global trends, as studies have observed the impact of LBP on dentists' practices[5,19-21]. Therefore, the objective of this study was to analyze the prevalence of LBP and the resulting degree of disability among primary care dentists in the northern macro-region of the Minas Gerais state, Brazil.

METHODS

This cross-sectional study evaluated primary health care dentists from 54 municipalities within the jurisdiction of the Regional Health Superintendence (*Superintendência Regional de Saúde* - SRS) of Montes Claros, located in the northern health macro-region of the Minas Gerais state, Brazil. The research was conducted between March and June 2022.

Data collection was conducted using a self-administered online questionnaire. To select the sample, the oral health coordinators of all municipalities within the regional jurisdiction were contacted via WhatsApp Messenger*. They were informed about the survey and requested to share the link to the questionnaire (Google Forms®) with the dentists in their respective municipalities, employing a convenience sampling approach. On March 2, 2022, the minimum sample size of 288 participants was calculated, considering the total of 1,146 dentists in the region, based on data from the TABNET system. The criteria for sample size calculation included a margin of error of 5%, confidence interval (CI) of 95% and estimated prevalence of 50%.

The inclusion criteria were defined as follows: being a dentist working in primary care within the geographical area covered by the SRS of Montes Claros. Exclusion criteria: be on sick leave from dental practice.

The questionnaire included questions related to sociodemographic profile, professional performance, physical activity and the presence of LBP as independent variables. Measurement and classification of these variables for the analyses were:

a) Gender: answer options "female" and "male".
b) Age group: measured using an open field and subsequently dichotomized into two groups - up to 30 years and 31 years or more.
c) Work in more than one job: variable with the answer options "yes" and "no".
d) Body mass index (BMI): was calculated using the self-reported weight and height by the participant. The formula used was weight (in kilograms) divided by height (in meters) squared. For classification of BMI, measures of the World Health Organization (WHO)[22] were adopted: BMI <18.5 kg/m² defined as underweight; >18.5 to 24.9 kg/m² as normal weight and ≥ a 25 kg/m² as overweight (overweight and obesity). For statistical analysis, the categories underweight, and normal weight were grouped, considering, through previous literature review, that overweight and obesity are risk factors for LBP[23].
e) Weekly workload: number of weekly hours spent working as dentist in the primary health care and private clinics, classified in two groups: up to 40 hours and above 40 hours.
f) Sedentary lifestyle: self-perception variable measured by participant's report with the "yes" and "no" answer options.
g) LBP: participants were asked about regions of the spine that had recently caused pain complaints. The absence of LBP was classified when the participant reported no pain in the specific region or selected the option "none". This variable was further dichotomized in the database with the classifications "yes" and "no".
h) Pain during work: measured by the Likert scale with response options "pain only at the end of the day"; "never"; "rarely"; "often" and "always". Later classified as "no" (never) and yes (rarely, often and always).

i) Sick leave by LBP (at some point in the career): also measured by Likert scale with "never"; "rarely"; "often"; "always" and "currently away due to back pain". Later classified as "no" (never) and "yes" (rarely, often, always and currently away due to back pain).

j) Physical activity practice: collected by the frequency of physical activity per week. Responses indicating no physical activity were classified as "no", while those reporting physical activity at least once a week were classified as "yes."

k) Position during tooth extraction: variable with the answer options "sitting on the owl" and "standing".

l) Excessive working hours: the responses that reported not performing any type of labor elongation was classified as "no", and those that reported performing at some point in the working day was classified as "yes".

The project was submitted and approved by the Institutional Research Ethics Committee (#CAAE 54196521.1.0000.5146).

Statistical analysis

The dependent variable, disability caused by LBP, was assessed by the Oswestry Disability Index 2.0 (ODI). This instrument aims to evaluate the disability caused by LBP, consisting of 10 items, each with 6 response options, evaluating the intensity of LBP and its impact on daily activities. The score ranges from 0 (without disability) to 100 (maximum disability), and the instrument was adapted to Brazilian Portuguese[24]. In this study, a cutoff point of 12 or greater was used, as recommended[25].

The collected data were transferred to the software Statistical Package for Social Science (SPSS®), version 22.0, where descriptive analysis, prevalence ratio (PR) calculation, and Pearson's Chi-square test were performed, considering the significance level of 5%. Additionally, a multivariate analysis was conducted using Poisson regression with robust variance. Variables with a significance level < 0.20 in the bivariate analysis were included in the multivariate analysis.

RESULTS

A total of 298 dentists from the 54 municipalities of the SRS of Montes Claros, Minas Gerais state, Brazil, participated in the study, with the majority being female (79.2%). The overall prevalence of LBP was 63.4%, with just over half of the sample reporting pain during work (52.0%) and 27.9% of the participants reporting sick leave by LBP. Further details on the sample characterization are provided in Table 1.

Professionals aged over 30 years exhibited a higher prevalence of low back impairment with disability (19.7%) compared to those under 30 years (6.8%; p=0.001). A higher prevalence of disability caused by LBP was observed in professionals with an overweight BMI (p=0.006), those who were sedentary (p=0.002), those who reported LBP (p=0.004) and pain during work (p<0.001), and those with a history of sick leave due to LBP (p <0.001). The overall prevalence of LBP with disability was 12.8%. The variables gender,

Table 1. Sociodemographic and labor characterization of primary care dentists in the northern macro-region of the Minas Gerais state, 2022 (n=298).

Variables	n	%
Gender		
Male	62	20.8
Female	236	79.2
Age group (years)		
≤30	161	54.0
≥31	137	46.0
More than one job		
No	181	61.6
Yes	113	38.4
Body mass index		
Underweight / normal weight	166	56.3
Overweight	129	43.7
Total weekly workload (hours)		
≤40	188	63.1
≥41	110	36.9
Sedentary lifestyle		
No	181	61.6
Yes	113	38.4
Low back pain		
No	109	36.6
Yes	189	63.4
Pain during work		
No	143	48.0
Yes	155	52.0
Sick leave by low back pain		
No	214	72.1
Yes	83	27.9
Physical activity		
No	77	25.9
Yes	220	74.1
Position during extractions		
Sitting in the owl	252	85.1
Standing	44	14.9
Labor elongation		
No	226	76.1
Yes	71	23.9

more than one job, weekly workload, physical activity, excessive working hours and position during extractions did not show statistically significant results (Table 2).

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Table 2. Bivariate analysis of disability by low back pain, according to the Oswestry Disability Index (ODI), in dentists from the northern macro-region of the Minas Gerais state, 2022 (n=298).

Variables	Low back pain				PR (95%CI)	p-value
	Without disability		With disability			
	n	%	n	%		
Gender						
Male	58	93.5	4	6.5	1	
Female	202	85.6	34	14.4	2.23(0.82-6.05)	0.095
Age group (years)						
≤30	150	93.2	11	6.8	1	
≥31	110	80.3	27	19.7	2.88(1.48-5.59)	0.001*
More than one job						
No	156	86.2	25	13.8	1	
Yes	100	88.5	13	11.5	0.83(0.44-1.56)	0.566
Body mass index						
Underweight/normal	153	92.2	13	7.8	1	
Overweight	105	81.4	24	18.6	2.37(1.25-4.48)	0.006*
Total weekly workload						
≤40	164	87.2	24	12.8	1	
≥41	96	87.3	14	12.7	0.99(0.53-1.84)	0.992
Sedentary lifestyle						
No	164	90.6	17	9.4	1	
Yes	92	81.4	21	18.6	1.97(1.09-3.58)	0.022*
Low back pain						
No	103	94.5	6	5.5	1	
Yes	157	83.1	32	16.9	3.07(1.32-7.12)	0.004*
Pain during work						
No	140	97.9	3	2.1	1	
Yes	120	77.4	35	22.6	10.76(3.38-34.23)	0.000*
Sick leave by low back pain						
No	207	96.7	7	3.3	1	
Yes	52	62.7	31	37.3	11.41(5.23-24.90)	0.000*
Physical activity						
No	66	85.7	11	14.3	1	
Yes	193	87.7	27	12.3	0.85(0.44-1.64)	0.649
Position during extractions						
Sitting in the owl	221	87.7	31	12.3	1	
Standing	37	84.1	7	15.9	1.29(0.60-2.75)	0.509
Labor elongation						
No	200	88.5	26	11.5	1	
Yes	59	83.1	12	16.9	1.46(0.78-2.75)	0.235
Overall prevalence	260	87.2	38	12.8	-	-

*Statistical association with Pearson's Chi-square test.

Table 3. Poisson regression with robust variance (predictive factors associated with Low Back Pain disability).

Variables	β	PR	95%CI	p-value
Female	1.036	2.81	1.13 – 7.01	0.026*
Overweight	0.547	1.72	1.01 – 2.96	0.047*
Low back pain	0.852	2.34	1.12 – 4.87	0.023*
Pain during work	1.352	3.86	1.23 – 12.13	0.020*
Sick leave by low back pain	1.665	5.28	2.29 – 12.18	0.000*

Only variables that presented statistical significance (≤0.05) were included. *Statistical significance (p≤0.05).

Table 3 shows the variables that remained in the final Poisson multiple regression model, which were associated with disability caused by LBP. These variables include female gender, overweight BMI, presence of LBP, pain during work and sick leave due to LBP.

DISCUSSION

In a sample of 298 dentists from Northern Minas Gerais, a high prevalence of LBP was found, with nearly 13% of the sample experiencing LBP-associated disability. The sample was predominantly female, with more than half reporting LBP at work and nearly one-third having taken sick leave due to LBP. Disability caused by LPB was associated with female gender, overweight BMI, the presence of LBP, pain during work, and sick leave due to LBP.

The prevalence of self-reported LBP identified in this study is consistent with other research findings that reported rates ranging from 50 to 69.7% among dentists[5,7,11,14-16,18,19]. However, it should be noted that there is variability in findings across the literature. Among musculoskeletal pain, LBP is the most prevalent among oral health professionals[3]. In a systematic review[26], a prevalence range of 15.7% to 88.9% was identified among thirteen studies and a pooled prevalence of 41.2% ($_{95\%}$CI: 27.5 - 54.9%) was calculated in meta-analysis[27]. Studies reporting the high prevalence of LBP in dentists[17,28] emphasize the role of exposure to ergonomic factors and tendencies to work-related illness.

Regarding the degree of disability, only one study that used ODI 2.0 for assessment was identified[4]. This study[4] identified a disability rate of 39.5%, which is higher than that identified in the present study, 14.4% of moderate to severe disability. However, it should be noted that the previous study did not associate the degree of disability with potential risk factors, whereas the present study was the first to examine the degree of disability by LBP in dentists.

Age was initially associated with the degree of disability but did not remain in the final model. Age group older than 31 years was associated with greater disability severity, a finding consistent with previous studies[4,12,18,28,29]. Discussions on age emphasize not only physiological conditions as aggravating factors of LBP but also a greater number of years in professional practice and the reduced adoption of preventive strategies during the work. A cross-sectional study, conducted with a probabilistic cluster sample in Saudi Arabia[7], identified that age was a predictor for musculoskeletal disorder. Furthermore, LBP presented a higher odds ratio associated with longer patient care duration and years

of experience. Additionally, in this study, a sedentary lifestyle was also associated with the degree of disability, but did not remain significant in the final model.

Sedentary lifestyle was present in 38.4% of this study population. Similar to this study, a higher prevalence of dentists who practice physical exercise more than once a week was identified in research conducted in the state of São Paulo, Brazil, with 204 professionals working in the public service[30] and in India, with 100 dentists[11]. In contrast, in another study only 17% of the sample practiced physical activities[13]. In the state of Minas Gerais, Brazil[31], a study with 358 dentists identified that physical exercise was a protective factor in relation to the onset of LBP (OR: 0.42 $_{95\%}$CI: 0.19 -0.91), as well as other studies that concluded that sedentary lifestyle was associated with the presence of LBP[16,32], with high odds ratio (OR: 2.33, $_{95\%}$CI: 1.25-4.36)[7]. However, another study did not find association between these variables[4] and instead associated the presence of LBP with the constant practice of physical exercises[33]. It is important to highlight that this finding differs from most studies on the subject, and physical exercise is essential to prevent MD[34,35] and positively influences clinical practice[36].

Overweight and obesity are strongly associated with sedentary lifestyle and this study showed that dentists with overweight BMI had LBP with a higher degree of disability. A systematic review[37] with 27 studies included on a meta-analysis found a higher chance of LBP in overweight people (OR=1.35, $_{95\%}$CI=1.14-1.59). A similar result was observed in a population-based longitudinal study conducted in Finland, in which high BMI was associated with LBP (OR=1.44, $_{95\%}$CI=1.12–1.85)[38].

Regarding labor activity, the presence of musculoskeletal pain, especially LBP, showed a significantly statistical association in Pakistani dentists weighing over 81 kg[18], but other studies that did not find correlation between BMI and the presence of LBP[4,7]. These findings may have been influenced by other contextual factors of each sample, as studies have reported varying prevalence rates of BMI and differing percentages of professionals who engage in physical activity.

Slightly more than half of the samples in this study (52.0%) reported pain during work, and 27.9% of respondents had taken sick leave due to LBP. Both variables remained in the final model associated with the degree of disability. There was a high rate of oral health professionals who reported LBP at work. A study involving just over 100 dentists[36] found that 72.8% of respondents reported pain during practice. Back pain sick leave was identified

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in one third of the sample of several studies[18,19,31,39]. LBP directly interferes with the worker's routine, impacting work capacity and QoL[31]. The sitting position at work has been consistently identified in scientific literature as being highly correlated with the magnitude and exacerbation this symptom during work[15,16,33].

Even without significative association in the bivariate analysis, the female was associated with the degree of disability caused by LBP in the multiple regression analysis. According to publications[3,7,20,28,39], LBP is strongly associated with females, mainly due to double work hours and anatomical variations[40]. However, some studies did not show association with gender[4,15,16,18,29], while others indicated worse outcomes for males[32]. It is interesting to note that the samples evaluated had a higher number of women working in dentistry, and that they are more likely to discuss their symptoms and seek health services more often.

The present study had several limitations that should be acknowledged. The data collection through a self-administered online questionnaire introduces potential memory biases and measurement errors. The convenience sampling limits are generalizations of this study. The health worker effect might also play a role, as dentists with a higher degree of disability due to LBP may be absent from work. Furthermore, this study focused on dentists working in primary care in a specific region, and caution is needed when extrapolating these findings to other body regions, such as work processes and factors such as weekly working hours, specialization in private clinics, job satisfaction, and the adoption of ergonomic preventive strategies may vary.

Despite these limitations, it is crucial to highlight the importance of the results of this study that identified a sample that presents a health problem that affects the QoL of the participants and that is directly linked to work. Thus, it is evident that the need for intervention and more studies in this population to improve QoL. It is crucial to identify local work factors that can contribute to the perpetuation of LBP and intensify the degree of disability, as well as inadequate labor practices, to prevent them.

CONCLUSION

A high prevalence of self-reported LBP was identified among dentists working in primary health care in the Northern macro-region of Minas Gerais, Brazil. Disability related to LBP had an overall prevalence of 12.8% and was associated with female gender, dentists with overweight BMI, self-reported LBP, work-related pain, and sick leave due to LBP. These findings are significant as they highlight not only the high prevalence but also the fact that a majority of dentists in primary care experience LBP with some degree of disability.

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