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RESEARCH ARTICLE **OPEN ACCESS**

Prolonged Sitting and Low Back Pain in Dental Practice: A Complex Relationship Explored in Jakarta

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Abstract:

Aims & Background: Low back pain (LBP) is the leading cause of disability globally, affecting approximately 619 million people in 2020, with projections suggesting that this number will rise to 843 million by 2050. LBP accounts for a significant proportion of years lived with disability (YLDs) worldwide. Dentists are particularly vulnerable to LBP due to the prolonged static and non-ergonomic postures required to access small areas within the oral cavity, which often results in extended examination times. Poor posture, such as prolonged standing or sitting, is a recognized risk factor for developing LBP. This study aims to examine the relationship between prolonged sitting duration during dental practice and the prevalence of LBP among dentists in Jakarta.

Materials and Methods: A cross-sectional study was performed involving 106 dentists, chosen through quota sampling based on specific inclusion and exclusion criteria. Data were gathered using a standardized questionnaire and the Roland-Morris Disability Questionnaire (RMDQ) to assess functional impairment due to LBP. The Chi-Square test was used to analyse the association between sitting duration and LBP complaints.

Results: The results showed no significant association between prolonged sitting duration (p = 0.617) or physical activity (p = 0.662) and the prevalence of LBP. However, age was significantly associated with LBP prevalence (p = 0.008), with dentists aged 46–65 years reporting a higher prevalence. Additionally, years of practice approached statistical significance (p = 0.057), suggesting a potential link between prolonged occupational exposure and the risk of LBP. Despite the lack of significance for sitting duration and physical activity, the findings highlight the importance of considering other factors, such as chair design, posture, movement patterns, and the cumulative impact of years of practice, that may contribute to LBP in this professional group.

Conclusion: Age and years of practice are important factors contributing to the prevalence of LBP among dentists, emphasizing the impact of age-related changes and prolonged occupational strain. While sitting duration and physical activity showed no significant association, the findings underscore the need for targeted ergonomic interventions and preventative strategies tailored to the specific demands of dental practice.

Keywords: Low back pain, Dentists, Prolonged sitting, Ergonomics, Cross-sectional study, Roland-morris disability questionnaire.

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1. INTRODUCTION

Low back pain (LBP) is a common musculoskeletal issue and the leading cause of disability globally. In 2020, LBP affected approximately 619 million people worldwide, with the number projected to rise to 843 million by 2050 [1]. LBP also accounts for a significant portion of years lived with disability (YLDs). Professions such as dental professionals are particularly at risk due to prolonged, non-ergonomic postures during clinical work, which further increases their susceptibility to LBP [2, 3]. Dentists are particularly at risk due to the prolonged sitting required while performing precise dental tasks, such as examinations, restorations, or surgeries, which involve maintaining a static posture for long durations [4, 5].

Prolonged sitting is frequently cited as a significant risk factor for LBP, particularly in occupations requiring extended static postures, like dentistry [6, 7]. Previous research shows mixed findings on the relationship between sitting duration and LBP; some studies identify a direct correlation, while others point to multifactorial influences, including ergonomic practices, breaks, and physical health [8-10]. Despite its potential impact, the relationship remains poorly understood in specific regions like Jakarta, where occupational factors and cultural practices may differ [11, 12].

Regional studies suggest that Jakarta's dental practitioners often face additional challenges, such as inadequate ergonomic resources and high patient volumes, further influencing LBP prevalence [12]. Ergonomic interventions, like posture adjustments and workstation redesign, have shown variable success in reducing LBP symptoms, depending largely on the adherence and awareness of practitioners [13, 14]. However, the effectiveness of these strategies among Jakarta dentists remains unclear due to a lack of targeted research.

Understanding the specific factors contributing to LBP in Jakarta's dental professionals is crucial for designing effective, culturally relevant interventions. While ergonomic interventions have shown promise in some settings [12, 15, 16], their adaptability and imple- mentation in Jakarta require careful evaluation. By examining prolonged sitting and other contributing factors, this study seeks to fill gaps in current research and provide insights for localized healthcare policy improvements [17].

Ultimately, this research seeks to contribute to the broader conversation on occupational health by examining the link between prolonged sitting and LBP among Jakarta's dentists. The findings may inform targeted strategies to reduce LBP prevalence, improving both health outcomes and professional quality of life in the region.

2. METHODS AND MATERIALS

2.1. Ethical Approval and Study Design

This cross-sectional study received approval from the Institutional Review Board of the Faculty of Medicine, Universitas Islam Negeri Syarif Hidayatullah Jakarta, on August 19th, 2023 (Protocol No: E-001-28-07-23). The study was conducted in compliance with the ethical standards outlined in the Declaration of Helsinki, ensuring the protection of participants' rights and well-being.

2.2. Study Population and Sampling

The study involved a sample of 106 dentists working in Jakarta recruited through quota sampling to ensure representation from various types of dental practices. Inclusion criteria included active dental practitioners aged 25–60 years, with a minimum of two years of professional experience. Dentists with known musculoskeletal conditions unrelated to work such as a history of spinal trauma, cancer, rheumatoid arthritis, ankylosing spondylitis, osteoporosis, bone tumours, bone infections, postural abnormalities, or those with a BMI outside the normal range (>25 kg/m^2), were excluded. Participants were approached between August and December 2023 to participate in the study.

2.3. Data Collection Instruments

Data were collected through a self-administered questionnaire distributed to participants during dental practice hours. The Roland-Morris Disability Questionnaire (RMDQ) was employed to assess the presence and severity of LBP, with scores greater than 3 indicating the presence of LBP. A separate custom-developed questionnaire was used to measure sitting duration, specifically defined as the time spent sitting while treating patients in a day, and categorized into two groups: 1–5 hours per day and >5 hours per day. Additional demographic data, including age, gender, years of professional experience, and BMI, were also collected to describe the characteristics of the sample.

2.4. Statistical Analysis

The data collected were analysed using SPSS version 26 (IBM Corp., Armonk, NY, USA). Descriptive statistics, including frequencies, percentages, means, and standard deviations, were utilized to summarize participant demographics. The relationship between sitting duration and the prevalence of LBP was examined using the Chi-square test. A *p*-value of less than 0.05 was deemed statistically significant. All statistical analyses were reviewed and validated by an independent expert statistician for accuracy.

3. RESULTS

The study involved 106 dentists in Jakarta, with 88.7% female and 11.3% male participants. The majority, 88.7%, were aged 25-45 years, while 11.3% were aged 46-65 years. Most dentists, 56.7%, had more than 10 years of practice, and 74.6% were general practitioners. Regarding sitting duration, 55.7% of dentists reported sitting for 1-5 hours per day, while 44.3% reported sitting for more than 5 hours per day during practice.

Of the respondents, 23.6% reported experiencing LBP in the last year, while 76.4% did not. Among those sitting for 1-5 hours per day, 25.4% experienced LBP, compared to 21.2% of those sitting for more than 5 hours. However, the Chi-square test showed no statistically significant relationship between sitting duration and LBP ($p = 0.617$).

Dentists who reported LBP also tended to have less physical activity; 69.8% exercised 1-2 times per week, while 22.6% did not exercise regularly. The data indicate no significant relationship between prolonged sitting duration and LBP prevalence ($p = 0.617$), as well as between physical activity and LBP ($p = 0.662$). However, a significant relationship was observed between age group and LBP prevalence ($p = 0.008$), suggesting that age may be a critical factor in the development of LBP. These findings align with previous studies highlighting the role of other contributing factors, such as posture, ergonomic conditions, and age-related physiological changes, in influencing LBP (Tables **1-4**)

Table 1. Demographic and professional characteristics of participants.

Characteristics	Category	Frequency (n)	Percentage (%)
Gender	Female	94	88.7
	Male	12	11.3
Age group	25 – 45 Years	94	88.7
	46 – 65 Years	12	11.3
Years of Practice	< 1 Year	6	5.7
	1 – 5 Years	20	18.8
	5 – 10 Years	20	18.8
	>10 Years	60	56.7
Specialization	Yes	27	25.4
	No	79	74.6
Total		106	100

Table 2. Characteristics of participants, sitting duration, and physical activity.

Characteristics	Category	Frequency (n)	Percentage (%)
Sitting Duration	1 – 5 hours/day	59	55.7
	>5 hours/day	47	44.3
Physical Activity	Never	24	22.6
	Occasionally (1-2 times/week)	74	69.8
	Everyday	8	7.6
Number of Patients Per Day	<2 patients/day	1	0.9
	2 – 5 patients/day	54	51
	>5 patients/day	51	48.1
Total		106	100

Table 3. Prevalence of LBP among participants.

Characteristic	Category	Frequency (n)	Percentage (%)
Low Back Pain (LBP)	LBP	25	23.6
	Non-LBP	81	76.4
Total		106	100

Table 4. Statistical analysis of sitting duration, age group, physical activity and years of practice in relation to LBP in the last year.

Low Back Pain in the Last Year								
-	-	LBP		Non-LBP		Total		*p-value*
-	-	n	%	n	%	n	%	
Sitting Duration	1 – 5 hours/day	15	25.4	44	74.6	59	55.7	**0.617**
	>5 hours/day	10	21.2	37	78.8	47	44.3	
Age Group	25 – 45 Years	18	19.1	76	80.9	94	88.7	**0.008**
	46 – 65 Years	7	58.3	5	41.7	12	11.3	
Physical Activity	Never	5	20.8	19	79.2	24	22.6	**0.662**
	Occasionally (1-2 times/week)	19	25.7	55	74.3	74	69.8	
	Everyday	1	12.5	7	87.5	8	7.6	
Years of Practice	< 1 Year	0	0	6	100	6	5.7	**0.057**
	1 – 5 Years	4	20	16	80	20	18.8	
	5 – 10 Years	9	45	11	55	20	18.8	
	>10 Years	14	20	46	80	60	56.7	

4. DISCUSSION

This study investigated factors associated with the prevalence of LBP among dentists in Jakarta, focusing on sitting duration, age, physical activity levels, and years of practice. A significant relationship was identified between age and the prevalence of LBP (p = 0.008), with individuals aged 46–65 years exhibiting a higher susceptibility to LBP compared to those aged 25–45 years. This finding highlights the potential impact of age-related physiological changes, such as intervertebral disc degeneration and reduced ligament elasticity, as key factors in the development of LBP. Furthermore, the "Years of Practice" variable approached statistical significance (p = 0.057), suggesting that individuals with longer years of practice (>10 years) may experience an increased risk of LBP, possibly due to cumulative occupational strain over time. Conversely, no significant associations were observed between prolonged sitting duration (>5 hours/day) and LBP (p = 0.617), nor between physical activity levels and LBP (p = 0.662). Although some results may appear counterintuitive, they offer unique contributions to the existing literature on LBP among healthcare professionals.

Firstly, the absence of a significant relationship between sitting duration (defined as the time spent sitting while treating patients in a day) and LBP challenges the prevailing notion that prolonged sitting is a primary risk factor for musculoskeletal disorders among dentists. Unlike other professions, dentists may adopt unique postures or ergonomic practices that mitigate the potential negative effects of sitting for extended periods. For instance, dentists are often required to alternate between sitting and standing or to adjust their positions frequently while treating patients, which may reduce the continuous strain on the lower back muscles. This adaptability might explain the lack of a significant association found in our study and suggests that other occupational factors, such as posture adjustments, ergonomic chair design, or the use of assistive devices, may play a more critical role in preventing LBP in this population.

Based on the data on sitting duration during practice among dentists in Jakarta, it was observed that most dentists in Jakarta have a sitting duration of 1–5 hours per day (55.7%). This finding aligns with a study by Juliatri (2021) on 148 dentists in North Sulawesi, where the majority of dentists had a sitting duration of ≤7 hours per day (91.9%), with only a minority (3.4%) having a sitting duration of >7 hours per day. Dentists often work in a sitting position with patients lying down, causing them to remain in one position for extended periods due to the relatively narrow and small working area in the oral cavity, which requires high concentration and a significant amount of time [15]. However, there was no significant relationship between sitting duration and complaints of LBP (p=0.278). This result emphasizes that, although sitting duration is a concern, other factors, such as working posture, may play a more significant role [18, 19].

In contrast, studies like that by Zaki (2008) reported that a sitting duration of 1–5 hours posed a higher risk for LBP (OR: 2.03) compared to durations >5 hours (OR: 1.60) [20]. This suggests that respondents accustomed to long

durations of sitting (>5 hours/day) may have developed better musculoskeletal endurance, potentially explaining why they experience lower rates of LBP than those with shorter sitting durations (1–5 hours/day). Additionally, findings from Phedy *et al*. (2016) in Indonesian dentists indicated that prolonged sitting was a significant exacerbating factor for musculoskeletal complaints (26.6%) [21]. However, our findings differ, reinforcing the need for more context-specific research.

Secondly, this study highlights the importance of considering local contexts when examining occupational health risks. The research was conducted in Jakarta, a city with specific cultural and environmental factors that may influence working habits and health outcomes [22]. For example, Jakarta's climate, urban environment, and healthcare infrastructure might lead to different occupational exposures compared to those in Western countries where most similar studies have been conducted. These differences underline the need for more context-specific studies to better understand the risk factors for LBP in diverse populations [11]. Moreover, the high patient turnover in urban clinics like those in Jakarta might encourage brief, frequent breaks that inadvertently reduce the risk of musculoskeletal strain, counteracting the effects of prolonged sitting duration.

Our study also aligns with Kumar M. (2020), who found no significant association between sitting duration and LBP among 151 dental specialists (p=0.0689) [23]. Nonetheless, 52.9% of dental specialists reported experiencing LBP, with factors such as gender and patient load showing a more substantial impact [23]. Suryawijaya E (2021) also reported no significant association between sitting duration and LBP among 171 healthcare professionals (p=1.000) despite 63.7% experiencing LBP [24]. These findings suggest that while sitting duration is a commonly investigated variable, other factors such as gender, workload, and ergonomic practices might play a more significant role.

This study also examined the relationship between age and the prevalence of LBP, revealing a significant association (p = 0.008). The findings suggest that age plays a crucial role in the development of LBP, which aligns with existing literature identifying age as a key risk factor for musculoskeletal disorders. Research by Hoy *et al*. (2012) [25] emphasizes that the prevalence of LBP increases with age, particularly among individuals aged 40–69 years, due to age-related degenerative changes in the spine, such as intervertebral disc degeneration, reduced elasticity of ligaments, and weakening of paraspinal muscles. These physiological changes can result in decreased spinal stability and increased vulnerability to mechanical stress. Furthermore, the cumulative impact of prolonged occupational strain and repetitive movements over time can exacerbate these vulnerabilities.

In addition to age, this study found that the “years of practice” variable approached statistical significance (p = 0.057), suggesting a possible association between prolonged occupational exposure and an increased risk of LBP. Healthcare professionals, such as dentists, often maintain awkward postures and perform repetitive tasks over many years, which can result in cumulative strain on the musculoskeletal system. This prolonged occupational stress likely compounds the age-related physiological changes, further elevating the risk of developing LBP. These findings underscore the importance of ergonomic interventions and strategies to mitigate the long-term impact of occupational strain, particularly for professionals with extended years of practice.

Furthermore, the findings of this study suggest that it is necessary to re-evaluate the focus of occupational health interventions for dentists. If sitting duration alone is not a significant predictor of LBP, then interventions solely aimed at reducing sitting time may be less effective than previously thought. Instead, a more holistic approach that includes ergonomic education and awareness about optimal working postures could provide a more comprehensive strategy to prevent LBP among dentists. This approach could be particularly beneficial in settings where resources for ergonomic adjustments are limited.

Additionally, our study contributes to the growing body of literature suggesting that LBP is a multifactorial condition influenced by various factors, such as individual biomechanics, genetic predispositions, and psychosocial elements [25-27]. The lack of a significant association between sitting duration and LBP reinforces the idea that a single factor may not fully explain the risk of developing LBP [28]. Future studies should consider a broader range of variables, including stress levels, physical fitness, and workplace ergonomics, to identify more comprehensive strategies for managing LBP in healthcare professionals.

While these findings may appear contrary to established beliefs, they also prompt consideration of the limitations of this study. The cross-sectional nature limits causal inference, and self-reported measures may introduce bias. Moreover, the lack of data on other potential confounders, such as the exact nature of the dental procedures performed, frequency of breaks, or other ergonomic factors, restricts the ability to draw definitive conclusions. This result highlights the importance of examining additional occupational variables in future research, such as patient treatment dynamics, the frequency and nature of posture adjustments, and the role of ergonomics in daily dental practice. Future research should employ longitudinal designs and objective measures, such as direct observation or ergonomic assessments, to validate these findings further. The relatively small sample size in this study represents a limitation, as it may impact the statistical power to detect significant relationships and limit the generalizability of the findings. Future studies should aim to include a larger sample with participants from various regions to clarify whether the results are specific to Jakarta or applicable to a broader context. A sufficiently large sample would also enable a more comprehensive analysis of potential confounding variables and risk factors associated with LBP.

Lastly, while the findings may seem contrary to

established beliefs, they serve as an important reminder of the complexity of musculoskeletal disorders in professional settings. These results underscore the need for caution in generalizing risk factors across different occupations and highlight the importance of conducting targeted studies that consider the specific demands and practices of each profession. The findings suggest that future research should focus on exploring a broader range of variables, including ergonomic practices, participant habits, medication use, psychosocial factors, and local context, to develop more effective prevention strategies for LBP in healthcare professionals. The unique cultural and environmental contexts, such as those in Jakarta, should be considered when designing interventions, ensuring they are tailored to the specific needs and conditions of the target population.

CONCLUSION

Despite the limitations of this study, the findings suggest that there is no significant relationship between sitting duration and physical activity levels with the occurrence of LBP among dentists in Jakarta. In contrast, age showed a significant association with LBP, and years of practice approached statistical significance, indicating potential occupational risk factors. This study highlights the importance of considering specific demographic and occupational factors when addressing LBP among healthcare professionals. A holistic approach, including ergonomic education and awareness of optimal work practices, is essential to manage and prevent LBP effectively. Future studies with longitudinal designs and objective measurements are needed to validate these findings and further explore the contributing factors.

AUTHOR'S CONTRIBUTION

L.H. conceived and designed the study, supervised the research, and drafted the manuscript. A.Z. contributed to data analysis and interpretation. D.A. collected the data and assisted with interpretation. M.R. and B.M. critically revised the manuscript, and N.T. contributed to overall revisions and finalizing the manuscript.

LIST OF ABBREVIATIONS

LBP	=	Low Back Pain
RMDQ	=	Roland-Morris Disability Questionnaire
YLDs	=	Years Lived with Disability

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

The study was approved by the Institutional Review Board of the Faculty of Medicine, Universitas Islam Negeri Syarif Hidayatullah Jakarta, Indonesia, with protocol number E-001-28-07-23.

HUMAN AND ANIMAL RIGHTS

All human research procedures followed were in accordance with the ethical standards of the committee responsible for human experimentation (institutional and national), and with the Helsinki Declaration of 1975, as revised in 2013.

CONSENT FOR PUBLICATION

Consent for the participation was obtained from all participants along with the questionnaire.

STANDARDS OF REPORTING

STROBE guidelines were followed.

AVAILABILITY OF DATA AND MATERIALS

The data supporting the findings of the article are available in the Zenodo at https://doi.org/10.5281/zenodo.14666556.

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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