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Risk Factors for Low Back Pain among Educational Staff: A Cross-sectional Study at a Single University

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ABSTRACT

Introduction: The work environment can pose risks of accidents or health issues for individuals or groups. Office jobs typically involve light tasks performed while seated at a desk in a well-equipped and comfortable workspace. However, such a work environment can create its own problems for workers, one of which is low back pain (LBP). This study aims to analyze the relationship between risk factors for low back pain among educational staff at Universitas Negeri Gorontalo.
Method: This study employed a cross-sectional design. The sample consisted of 186 educational staff at Universitas Negeri Gorontalo, selected using cluster random sampling technique. Data were collected through questionnaires and Rapid Upper Limb Assessment (RULA) observation sheets to assess age, work experience, smoking habits, stress, and work posture. Data analysis used chi-square test to examine the relationships between variables and logistic regression to identify the most influential variables.
Results: The statistical analysis showed a significant relationship between LBP and age ($p = 0.001$) and work posture ($p < 0.001$). Other factors such as gender, work experience, smoking habits, and stress did not show a significant relationship with LBP. Age had the greatest influence on LBP (Exp (B) = 0.427).

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Conclusion: Age and work posture are factors associated with the occurrence of LBP. Improving sitting posture while working and taking regular breaks to stretch are necessary to reduce the risk of LBP. An appropriate prevention strategy is crucial to protect workers from LBP, which can also lead to increased productivity.

Keywords: Age, educator professional, low back pain, work posture

Introduction

The work environment can pose risks of accidents or health problems for individuals or groups. Office work is often associated with light work that involves sitting behind a desk and being in a building equipped with facilities to support work and comfort for employees. The work environment may contribute to various health issues among employees, notably low back pain (LBP). LBP is a significant health concern that impacts individuals across all age groups and ranks among the top 10 prevalent conditions in developing nations. This condition can lead to mobility challenges, diminished quality of life, adverse mental health effects, restrictions in occupational duties, and social interactions with family and peers.[1] A report by the Riset Kesehatan Dasar (2018) indicates that in Indonesia, the prevalence of LBP diagnosed by healthcare professionals is 11.9%, whereas self-reported diagnoses or symptoms reflect a prevalence of 24.7%. Additionally, subjective complaints of LBP are reported by 83.3% of workers.[2]

The risk factors associated with LBP among workers can be categorized into three primary groups: individual, occupational, and environmental. Marras & Karwowski identify factors that influence the prevalence of LBP, including age, gender, body mass index, work experience, smoking habits, educational attainment, income level, and history of physical activity.[3] These findings align with research that establishes a correlation between age, work experience, workload, ergonomic posture, repetitive actions, and prolonged static work duration with LBP observed in workers at the onion peeling unit in Pasar Angso Duo, Jambi City. Furthermore, academic staff at institutions such as Universitas Negeri Gorontalo are at risk for LBP due to their roles in facilitating educational services. According to Indonesian Law No. 20/2003, Article 39, paragraph 1, educational personnel are tasked with administrative, management, development, supervision, and technical services essential to the educational process.[4] Human resources play a crucial role in organizational implementation, and their health is essential for performance, productivity, and quality. This phenomenon also applies to human resources in higher education institutions.[5]

Based on initial observations, Universitas Negeri Gorontalo has a circular letter No. 1786/UN47.A2/KP/2022 dated July 25, 2022, which outlines the working hours for civil servant educational staff and contract staff. The working hours are Monday to Friday, from 08:00 to 16:30, with a break from 12:00 to 13:00 WITA. As of November 2024, there were 639 educational staff members at the university, distributed across various work units. Some 20 staff members have experienced LBP. They spend most of their working hours sitting at a desk with a bent posture, which can trigger health issues such as LBP. To promote a healthy campus environment, Universitas Negeri Gorontalo participates in the "Healthy Campus" program, aiming to improve health quality in higher education settings. This study is expected to support the program, particularly in early detection of health problems. Therefore, this research aims to analyze the risk factors for LBP among educational staff at Universitas Negeri Gorontalo.

Methods

This research utilized a quantitative methodology with a cross-sectional design. The independent variables examined included age, gender, work experience, smoking habits, work posture, and work-related stress, while the dependent variable focused on LBP. The study population comprised all educational personnel at Universitas Negeri Gorontalo, from which a sample of 186 respondents. The sampling technique used in this study is cluster sampling, which involves dividing the population of educational staff into several clusters based on work units. Then, several work units are randomly selected as research locations, such as faculties and other work units. All educational staff working in these units are used as respondents. Data collection occurred between January and February 2025, utilizing structured questionnaires and RULA observation tools. Prior to implementation, the research instruments underwent validation and reliability testing, yielding satisfactory validity results (Sign. (2-tailed) < 0.05) and strong internal consistency (Cronbach's Alpha > 0.7) in a separate pilot sample. Data analysis encompassed univariate, bivariate, and multivariate techniques. Univariate analysis was employed to assess the frequency distribution and percentage of LBP risk factors, while bivariate analysis utilized Chi-square tests to explore the associations between independent variables and LBP. Finally, multivariate analysis through logistic regression was conducted to identify factors that concurrently influence the occurrence of LBP. This study had received ethical approval from the Health Research Ethics Committee of the Faculty of Sports and Health, Gorontalo State University with approval number 239A/UN47.B7/KE/2024.

Result

Table 1 shows that the majority of respondents were aged 36-45 years or late adulthood (59.1%), female (53.2%), had more than 5 years of work experience (60.8%), did not have a smoking habit (69.4%), had non-ergonomic work posture (66.7%), had moderate stress levels (49.5%), and experienced LBP complaints (54.2%).

Table 1. Frequency distribution of respondents by age, gender, work experience, smoking habits, work posture, work stress, and low back pain

Variable		Frequency (f)	Percentage (%)
Age	26-35 Years (Early Adulthood)	20	10.8
	36-45 Years (Late Adulthood)	110	59.1
	46-55 Years (Early Elderly)	44	23.7
	56-65 Years (Late Elderly)	12	6.5
Gender	Male	87	46.8
	Female	99	53.2
Work Experience	> 5 Years	113	60.8
	<5 Years	73	39.2
Smoking Habits	Smoker	57	30.6
	Non-Smoker	129	69.4
Work Posture	Ergonomic	62	33.3
	Non-Ergonomic	124	66.7
Stress	Mild	15	8.1
	Moderate	92	49.5
	Severe	79	42.5
Low Back Pain	With Complaints	102	54.8
	Without Complaints	84	45.2

Table 2 presents the findings from the Chi-Square analysis, indicating a significant association between LBP and two factors: age ($p = 0.001$) and work posture ($p < 0.001$). Conversely, other variables, including gender ($p = 0.231$), work experience ($p = 0.231$), smoking habits ($p = 0.688$), and work-related stress ($p = 0.916$), do not demonstrate a statistically significant association with LBP.

Table 2. Analysis of the relationship between age, gender, work experience, smoking habits, work posture, work stress, and low back pain among educational staff

Variable		Low Back Pain						*P-Value*
		With Complaints (n=102)		Without Complaints (n=84)		Total (N=186)		
		n	%	n	%	n	%	
Age	26-35 Years	5	2.7	15	8.1	20	10.8	0.001*
	36-45 Years	57	30.6	53	28.5	110	59.1	
	46-55 Years	29	15.6	15	8.1	44	23.7	
	56-65 Years	11	5.9	1	0.5	12	6.5	
Gender	Male	58	31.2	55	29.6	113	60.8	0.231
	Female	44	23.7	29	15.6	73	39.2	
Work Experience	> 5 Years	58	31.2	55	29.6	113	60.8	0.231
	<5 Years	44	23.7	29	15.6	73	39.2	
Smoking Habits	Smoker	30	16.1	27	14.5	57	30.6	0.688
	Non-Smoker	72	38.7	57	30.6	129	69.4	
Work Posture	Ergonomic	15	8.1	47	25.3	62	33.3	<0.001*
	Non-Ergonomic	87	46.8	37	19.9	124	66.7	
Stress	Mild	9	4.8	6	3.2	15	8.1	0.916
	Moderate	50	26.9	42	22.6	92	49.5	
	Severe	43	23.1	36	19.4	73	42.5	

Chi-square test, *significant at $p < 0.05$

Table 3 shows that age ($p = 0.001$) and work posture ($p < 0.001$) are variables that significantly influence LBP. Among these two variables, age is the most influential variable on LBP, with an Exp(B) value of 0.427.

Table 3. Analysis of knowledge, attitude, and practice scores before and after intervention

Variable	B	S.E	Wald	Df	Sig.	Exp (B)
Age	-0.851	0.254	11.239	1	0.001	0.427
Work Posture	-1.953	0.367	28.304	1	<0.001	0.142
Constant	4.945	0.869	32.366	1	<0.001	140.519

Discussion

The relationship between age and low back pain complaints

The results show that the age group 35-46 years had the highest representation among those with LBP complaints, with 57 respondents, followed by the 36-45 age group with 29 respondents, the 56-65 age group with 11 respondents, and the 23-35 age group with 5 respondents. A noteworthy association exists between age and LBP complaints among the educational staff at Universitas Negeri Gorontalo. This association is substantiated by Chi-Square analysis, which produced a P-value of 0.001 ($p < 0.05$).

Various factors, including lifestyle choices and insufficient physical activity, may influence complaints of LBP among individuals aged 26 to 35. In general, the onset of muscular complaints typically begins during the productive age span of 25 to 65 years, with a noticeable decline in muscle strength occurring around the age of 60. However, in this study, it was surprisingly found that one respondent aged 56-65 years did not experience LBP complaints. This could be attributed to the individual's ability to adapt to their body and lifestyle, a history of healthy living, and pain tolerance. According to the theory of degenerative processes in the human intervertebral disc, degeneration begins around the age of 30, leading to tears, scarring, reduced disc fluid, and permanent narrowing of the disc space, ultimately causing spinal instability. This degeneration reduces the nucleus fluid, decreasing the capacity to withstand loads and pressure during continuous movement, which is rationalization of people over 30 tend to experience complaints related to joints, muscles, and bones.[6]

In line with the research conducted by Saputra, which examined 36 batik workers at Sanggar Batik Semarang. Saputra's study identified a significant association between age and the incidence of LBP, reporting a p-value of 0.020 ($p < 0.05$). The conclusion indicates that individuals aged 35 are more susceptible to developing LBP.[7]

The relationship between gender and low back pain complaints

According to the research findings, 58 male respondents (31.2%) reported experiencing LBP, while 44 female respondents (23.7%) indicated similar complaints. The Chi-Square test results yielded a value of 0.231, suggesting no significant association between gender and LBP among the educational staff.

The absence of a significant relationship may be influenced by the unequal distribution of respondents across gender categories. In this study, males represented the majority with 113 respondents (60.8%), while females comprised 73 respondents (39.2%). Biologically, females exhibit anatomical characteristics such as a wider pelvis, which can influence spinal

biomechanics, whereas males typically possess greater muscle mass, potentially providing some protection against injury. However, these anatomical differences do not straightforwardly translate into LBP complaints. These findings are consistent with research conducted by Aenia et al., which reported a p-value of 1.000 in the analysis examining the relationship between gender and LBP complaints, confirming no significant relationship.[8] Similarly, the study conducted by Nurjannah yielded a p-value of 0.0857 ($p > 0.05$), further supporting the conclusion of no significant association between gender and LBP complaints.[9]

The relationship between work experience and low back pain complaints

According to the research findings, 58 respondents (31.2%) with more than five years of work experience reported LBP complaints, while 44 respondents (23.7%) with less than five years of work experience also indicated similar complaints. The Chi-Square analysis resulted in a p-value of 0.231, with a significance threshold set at $\alpha = 0.05$, suggesting no statistically significant relationship between work experience and the incidence of LBP among the educational staff at Universitas Negeri Gorontalo.

The majority of respondents were long-term workers, with 113 respondents (60.8%) having worked for more than 5 years. Each individual has a different level of physical adaptation to their job, which may explain why work experience is not directly related to LBP complaints. If the work environment is designed ergonomically, workers with long work experience can still avoid LBP. Educational staff tend to perform varied tasks, including supporting academic, administrative, and operational activities on campus. This task variation may be one argumentation of work experience does not show a direct relationship with LBP complaints. This investigation aligns with the findings of Yacob et al., who studied 42 nurses in the inpatient unit of Bhayangkara Hospital Level III Manado. Their research revealed no significant correlation between work experience and the incidence of LBP complaints among the participants.[10]

The relationship between smoking habits and low back pain complaints

The majority of participants in this study were non-smokers, with 129 individuals (69.4%) reporting they did not smoke. A total of 30 participants (16.1%) who identified as smokers reported complaints from LBP. The bivariate analysis revealed no significant association between smoking habits and the incidence of LBP, yielding a p-value of 0.688. Interestingly, a higher proportion of non-smokers reported experiencing LBP complaints, suggesting that smoking habits do not have a statistically significant impact on the prevalence of LBP. This finding aligns with the research conducted by Syuhada et al. among tea pluckers in the Ciater Tea Plantation, Subang Regency, which also found no significant relationship

between smoking habits and LBP complaints, as evidenced by a p-value of 0.275.[11]

However, this study contradicts the findings of Arma et al., which reported a significant relationship between smoking habits and LBP complaints among public transportation drivers in Palembang.[12] This discrepancy may be due to the varying types of occupations among respondents in each study. Several studies have suggested that smokers are 1.5 to 2.5 times more likely to experience LBP, potentially due to reduced blood flow and oxygen supply to the spinal tissues. Carbon monoxide from cigarette smoke binds to hemoglobin, hindering and reducing oxygen delivery in the blood. Nicotine in cigarettes also causes vasoconstriction of blood vessels, which supply nutrients to the cells in the intervertebral discs. As a result, the cells in the discs experience nutrient and oxygen deficiencies, making them more susceptible to damage. Additionally, nicotine has a negative impact on osteoblast cells, affecting their proliferation and metabolism, as well as collagen synthesis, ultimately reducing bone mineral density.[12]

The relationship between working posture and low back pain complaints

The study found that 15 respondents (8.1%) with ergonomic working postures experienced LBP complaints, while 87 respondents (46.8%) with non-ergonomic working postures also experienced similar complaints. The Chi-Square test produced a p-value of 0.000 ($p < 0.05$), suggesting a significant association between working posture and LBP complaints. Non-ergonomic postures can cause excessive pressure on the spinal structures, muscles, and ligaments. The nature of educational staff work, which is often administrative and involves prolonged sitting, increases the risk of LBP.

Poor sitting positions, such as slouching or sitting without back support, can cause strain on the lower back muscles and weaken the core muscles that support the spine. Educational staff who sit for prolonged periods without stretching may experience muscle stiffness and LBP. The findings from this study align with those of Bantoro et al., which identified a significant association between working posture and the incidence of LBP among weaving workers at PT. Apac Inti Corpora, with a p-value of 0.022.[13] Moreover, this study corroborates the research conducted by Saputra, which established a notable association between working posture and the prevalence of LBP, reporting a p-value of 0.042.[7] The evidence suggests that improper working postures can increase the risk of musculoskeletal disorders (MSDs) by a factor of three, as these postures necessitate sustained muscular exertion. Furthermore, working postures that engage multiple muscle groups may contribute to work-related health issues, including musculoskeletal complaints, particularly when inadequate body positioning is present.

The relationship between stress and low back pain complaints

Based on the research findings, nine respondents (4.8%) with mild work stress experienced LBP complaints, 50 respondents with moderate work stress experienced similar complaints, and 43 respondents (23.1%) with severe work stress also experienced LBP complaints. The Chi-Square test produced a p-value of 0.916, suggesting no statistically significant association between stress levels and the incidence of LBP among the educational staff at Universitas Negeri Gorontalo.

This may be due to the fact that most educational staff have long working experience as civil servants with stable job status, making them accustomed to handling work stress. The positive impact of stress can motivate educational staff to complete their work optimally. This study is consistent with previous research, which found no significant relationship between work stress and LBP complaints. The reaction to stress can be psychological or physical, and stressed educational staff may exhibit behavioral changes. Coping mechanisms can involve fighting stress or withdrawing, often alternating depending on the situation and type of stress.[9,14]

The limitations of this study include several crucial aspects. Firstly, the population limitation is a concern because the study only involves educational staff within the university environment, limiting the generalizability of the findings to a broader university population. Secondly, the cross-sectional research design means that the relationship between risk factors and LBP complaints can only be described at a specific point in time, thus unable to directly explain cause-and-effect relationships. Thirdly, the data is subjective because it was collected through self-reporting questionnaires, which heavily relies on respondents' perceptions and memory, potentially leading to information bias (both overreporting and underreporting of complaints). Lastly, this study did not involve physical examinations, which means the accuracy in identifying LBP conditions medically is limited due to the absence of clinical examinations or objective posture assessments.

Conclusion

There is a relationship between LBP and age and working posture. Other factors such as gender, work experience, smoking habits, and stress did not show a significant relationship with LBP. Age has the greatest influence on LBP. The present study suggests an improving sitting posture while working and taking regular breaks to stretch are necessary to reduce the risk of LBP. Effective prevention strategies are crucial to protect workers from LBP and increase productivity.

Conflicts of Interest

Nothing to declare

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Nothing to declare

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