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Analysis of the Behavior of Biology Program Students at the Faculty of Science and Technology, Pattimura University in Preventing Low Back Pain

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Abstract: Low Back Pain (LBP) is a common health issue experienced by many individuals, including students. The risk of LBP can increase due to poor posture habits, unhealthy activity patterns, and a lack of knowledge about the importance of prevention. LBP is often caused by a combination of factors, including an inactive lifestyle, physical strain from prolonged sitting, and physical stress due to demanding academic tasks. This study aimed to examine factors influencing LBP prevention behavior among biology students. A cross-sectional approach was used. This research was conducted in 2024 at the Department of Biology, Faculty of Science and Technology, Pattimura University. Data were collected through questionnaires administered to 76 active students.The data were then analyzed using univariate and bivariate methods. The results showed that most respondents (77.6%) were between 18 and 20, with 88.2% female, and most had a normal body weight (59.2%), while 30.3% were underweight. The most common source of information about Low Back Pain (LBP) was healthcare providers (32.9%). Regarding LBP prevention behavior, 44.7% of respondents exhibited positive behavior, while 55.3% tended not to adopt effective preventive measures. Chi-square tests indicated no significant relationship between age, gender, and BMI with LBP prevention behavior. This study provides novel insights into LBP prevention behaviors among university students in eastern Indonesia. However, a significant relationship was found between the source of information about LBP and LBP prevention behavior.

Keywords: Low Back Pain, Biology students, Body Mass Index, Posture habits, Health education.

Introduction

Low Back Pain (LBP) is an acute pain occurring in the lumbar area, specifically between the fifth lumbar vertebra and the sacrum (L5-S1) (Manery et al., 2023; Rajadurai et al., 2024). Mahendra (2018) states that pain in the lower back is often accompanied by radiating pain to the legs and thighs. LBP is one of the most common musculoskeletal disorders, which can significantly reduce the quality of life, especially in older adults. It is estimated that approximately 80% of the general population will experience LBP at least once in their lifetime (Park et al., 2019). Kim et al. (2017) also note that LBP is the most prevalent musculoskeletal issue affecting an individual's lifestyle.

The prevalence of LBP, according to data from the World Health Organization (WHO) in 2022, states that musculoskeletal disorders in the world number 1.71 billion while the incidence of LBP is the 3rd health problem in the world, including osteoarthritis in 2022, numbering 528 million people, rheumatism in 2020 numbering 335 million people and low back pain in 2022 numbering 17.3 million people (WHO, 2024). In Indonesia, according to Riskesdas (2021), the prevalence of low back pain is 12,914 people or 3.71%. Low back pain in Indonesia is ranked 2nd after influenza (Riskesdas, 2021). Supported by the Indonesian Neurologist Association PERDOSSIS in 14 teaching hospitals, it is known that out of 4,456 pain sufferers from the total visits, 819 people suffer from low back pain. Based on data from the National Health Interview Survey (NHIS) in 2019, the incidence of Low Back Pain is 39% in adults (18 years and over) in the United States and increases with age, ranging from 28.4% (18-29 years), 35.2% (30-44 years), 44.3% (45-64 years), and 45.6% (65 years and over) (Centers for Disease Control and Prevention, 2019).

LBP is one of the musculoskeletal disorders caused by repetitive movements and poor body posture. Almost 80% of the population has experienced low back pain in their lifetime. The pain in the lower back originates from the spine, muscles, nerves, or other structures within the spinal region. The problem can be caused by an ergonomically incorrect posture that strains the muscles of the lower back and can cause damage to the surrounding tissue (Valero et al. 2016). This imbalance results in limited movement, reducing lumbar mobility due to pain, cramps, and muscle imbalance, affecting functional activities (Chamberlain et al., 2013). Another impact of LBP is decreased physical activity, which can exacerbate health conditions and long-term quality of life due to reduced mobility (Jaffar & Rahman, 2017; Vanti et al., 2019; Noormohammadpour et al., 2019; Schwertner et al., 2020)

LBP is increasingly common among students, and technology development and easy access to information lead to a sedentary lifestyle. Students often spend hours in front of computers, reading books, or writing without paying attention to the principles of proper ergonomics (Pangemanan et al., 2024; Loilatu et al., 2024). When performed over extended periods, these activities can negatively affect posture, particularly when sitting in an improper position. The habit of slouching or leaning forward, combined with using chairs that do not support the body well, increases pressure on the lower back area, ultimately putting students at risk of developing LBP. A study by Manery et al. (2023) found that the duration of sitting is significantly associated with LBP complaints among students in the Biology Department of the Faculty of Mathematics and Natural Sciences at Pattimura University. Although the sitting position was not significantly associated with LBP complaints, it was not specified what type of sitting position was analysed or whether other factors (such as posture or ergonomics) were considered.

According to Salsabil et al. (2024), the lack of awareness regarding maintaining good posture is one of the main factors exacerbating the LBP problem. Students often do not realize that poor habits, such as sitting in non-ergonomic positions or having insufficient physical activity, cause a decrease in functional capacity and quality of life. A scientific construction about the risk of chronic pain, persistent LBP can disrupt students' learning activities and the overall quality of life. Furthermore, students tend to focus

more on academic activities and spend less time engaging in physical exercise or stretching, which could strengthen the core and back muscles. Low physical activity levels can cause weakness in the muscles surrounding the spine, thereby increasing the load on spinal structures and triggering LBP. The purpose of this study is to examine the behavior of Biology students at Pattimura University in preventing the occurrence of LBP.

Research Problem

This study originates from the issue of the high potential risk of low back pain (LBP) among university students. This risk is strongly presumed to be associated with daily habits that neglect ergonomic principles, such as prolonged sitting, carrying heavy bags filled with books and laptops, and a lack of awareness and implementation of preventive measures against LBP. Specifically, this research highlights the low level of student awareness regarding the importance of maintaining proper posture and engaging in physical activities that support spinal health, ultimately contributing to the increasing incidence of LBP among this population.

Research Focus

This study will explore the extent to which students understand the importance of LBP prevention and evaluate the habits or behavior patterns they apply daily.

Research Aim and Research Questions

This study aimed to analyze the behavior of the Biology Study Program students of FST Pattimura University in preventing low back pain (LBP).

This research question is about the behavior of students of the Biology Study Program at FST Pattimura University in preventing low back pain and what factors influence their awareness and actions in maintaining back health.

Literature Review

Low Back Pain (LBP) is a common health issue experienced by many individuals, including students, and can significantly affect their daily lives and activities. A combination of interconnected physical and psychosocial factors typically causes this condition. From a physical perspective, poor habits such as prolonged sitting with improper posture, lifting heavy loads without proper technique, and insufficient physical activity that could strengthen the back muscles increase the risk of developing LBP. Additionally, psychosocial factors are equally significant, as stress, anxiety, or even depression can exacerbate muscle tension in the lower back area and intensify pain.

For students, high academic pressure and heavy study demands, coupled with prolonged use of computers or electronic devices, often lead to neglect of proper posture. This can result in muscle tension that gradually develops into LBP. Furthermore, the lack of awareness about the importance of prevention and proper ergonomic practices in daily life exacerbates the condition. Therefore, more serious preventive measures are needed, such as improving posture habits, engaging in regular physical activity, and managing stress, so students can mitigate LBP's negative impacts and maintain overall physical health.

Materials and Methods

Low back pain (LBP) is a common health problem experienced by many individuals, including university students, which can affect quality of life, productivity, and long-term health. The risk of developing LBP is high in college students, especially those who often spend long periods in front of a

computer or sit in non-ergonomic positions during lectures or studying. Despite this, prevention of LBP through healthy behaviors, such as maintaining good posture, exercising regularly, and avoiding bad habits, is still lacking.

Sample and Participants

The population in this study consisted of all students from the Biology Department at the Faculty of Science and Technology, Pattimura University. The sample for this study comprised 223 students from the Department of Biology.

The inclusion criteria in this study were:

1. Recorded as students of the biology study programme 2020-2024.
2. Not diagnosed with chronic diseases identified in the musculoskeletal system
3. Willing to be a respondent.

The exclusion criteria in this study are:

1. Respondents did not fill out the questionnaire completely.
2. Respondents who did not return the questionnaire.

The determination of sample size is done using the unpaired categorical analysis formula.

$$n1=n2=\left(\frac{Z\alpha\sqrt{2PQ}+Z\beta\sqrt{P1Q+P2Q2}}{P1-P2}\right)^2$$

Description:
Zα : Derivat baku alfa = 1.282
Zβ : Derivat baku beta = 0.84
P2 : Proportion in the group whose value is already known (0.7)
Q2 : 1-P2
P1 : Proportion in the group whose value is the judgement of the researcher (P2 + 0.2)
Q1 : 1-P1
P : Total proportion (P1+P2)/2
Q : 1-P
Since there were no previous studies, the value of P2 was set based on a rational estimate = 0.7.47,48 Thus:
P2 = 0,7
P1 = P2 + 0.2 = 0.7 + 0.2 = 0.9
P = P1+P2/2 = 0.9+0.7/2 = 0.8
Q1 = 1 - P1 = 1 - 0.9 = 0.1
Q2 = 1 - P2 = 1 - 0.7 = 0.3
Q = 1 - P = 1 - 0.8 = 0.2
Furthermore, it is entered into the formula for calculating unpaired categorical analytical samples with a standard alpha derivative of 95% and a standard beta derivative of 20%, becoming:

$$n1=n2=\left(\frac{Z\alpha\sqrt{2PQ}+Z\beta\sqrt{P1Q+P2Q2}}{P1-P2}\right)^2$$

$$n1=n2=\left(\frac{1,282\sqrt{2(0,8)(0,2)}+0,84\sqrt{(0,9)(0,1)+(0,7)(0,3)}}{0,9-0,7}\right)^2$$

n = 35

So, according to the formula above, the sample size is ± 35 samples. The number of samples is increased by 10% to avoid missing observations. In this study, there are 38 samples in each sample group, and the total minimum sample is 76 (Manery et al., 2024; Ciputra et al., 2025).

The sample size determination in this study was conducted using the unpaired categorical analysis formula. Based on the calculations, the required sample size was 36 per group, with the total minimum sample used in this study being 72 samples.

Instruments and Procedures

The instrument used in this study was a questionnaire adapted from Prasetyani. The questionnaire consisted of 13 items, divided into two types: positive statements (items 1, 3, 5, 7, 9, and 12) and negative statements (items 2, 4, 6, 8, 10, 11, and 13). The scoring for positive statements was as follows: always = 4, often = 3, rarely = 2, and never = 1. For negative statements, the scoring was arranged as follows: always = 1, often = 2, rarely = 3, and never = 4. The reliability test results show Cronbach's Alpha value ≥ 0.6, meaning that the questionnaire from this study is reliable and capable of being used as a data collection tool.

Data collection in this study was conducted by measuring both individual and group objects. The data were independently collected by the researcher. The steps taken in the data collection process were as follows:

1. The researcher obtained permission from the relevant authorities to conduct the study.
2. The researcher explained the research objectives and the procedure for filling out the questionnaire to the respondents.
3. Informed consent was obtained, where the respondents gave their approval to participate in the study.
4. The researcher distributed the questionnaires to the respondents for completion.
5. The collected data were processed and analyzed.

Data Analysis

Univariate analysis

After all the data were collected through the questionnaire, they were grouped according to the sub-variables being studied. The responses from the respondents for each statement were then summed up and analyzed using the Likert scale. This Likert scale was used to measure the intensity or frequency of each statement answered by the respondents, based on the previously determined scores. The results were then calculated and analyzed to identify trends or patterns emerging in the data.

To determine the mean T (MT), the following formula is used:

$$MT = (\Sigma T)/n$$

Where:

MT = Mean T

ΣT = Total sum

n = Number of respondents

To determine the behavior of respondents using the T score, the formula is as follows:

$$T = 50 + 10 * ((xi - \bar{x})^2 / s)$$

Where:

xi = Respondent's score

$\bar{x}$ = Group mean

s = Standard deviation (group's standard deviation)

Determining Standard Deviation (SD)

The standard deviation (SD) is calculated using the following formula:

$$SD = \sqrt{(\Sigma fi\ (xi - \bar{x})^2 / (n - 1))}$$

Where:

SD = Standard deviation

Σfi = Sum of frequency

xi = Interval point

$\bar{x}$ = Mean

n = Number of respondents

To determine the behavior category of respondents, the median value (T mean T) in the group is calculated, resulting in the following:

- Positive behavior is indicated when the respondent's T > T mean.
- Negative behavior is indicated when the respondent's T < T mean.

Bivariate analysis

To determine whether there is a relationship between age, gender, body mass index (BMI), and sources of information about LBP with LBP prevention behavior among students, a chi-square test is employed. Data analysis uses the Statistical Package for the Social Sciences (SPSS) version 24.00. The hypothesis testing criterion is set with a significance level (α) of less than 0.05. If the p-value < α (0.05), the alternative hypothesis (Ha) is accepted, indicating a significant relationship between the variables. Conversely, if the p-value > α (0.05), the null hypothesis (Ho) is accepted, meaning no significant relationship exists between the variables tested. The chosen analysis methods facilitate the identification of statistically significant associations between the socio-demographic characteristics of students and their behavioural strategies for LBP prevention.

Results

Univariate Analysis

The results of the univariate analysis on the distribution of respondents based on age, gender, sources of information about LBP, frequency of information, and respondents' behaviors can be seen in Table 1

Table 1

Distribution of Respondents

Variable	n	%
Age		
>18 years	6	7.9
18-20 years	59	77.6
21-25 years	11	14.5
Gender		
Male	9	11.8
Female	67	88.2
Body Mass Index (BMI)		
Underweight	23	30.3
Normal weight	45	59.2
Overweight	7	9.2
Obesity	1	1.3
Source of Information about LBP		
Electronic media	11	14.5
Health personnel	25	32.9
Education/School	9	11.8
Mass media	17	22.4
Other	14	18.4
Frequency of Information		
1 time	50	65.8
2-3 times	18	23.7
>3 times	8	10.5
Behavior to Prevent LBP		
Positive behavior	34	44.7
Negative behavior	42	55.3

From Table 1, it can be seen that the majority of respondents (77.6%) were aged between 18 and 20, with only 7.9% being older than 18 and 14.5% in the 21-25 age group. This indicates that most of the study participants are from a younger age group, which may be linked to activity patterns or lifestyles that put them at risk for back health problems such as LBP.

Most respondents were female (88.2%), while males made up only 11.8%. This gender imbalance should be noted as it could affect the generalizability of the study's results. If the proportion of males is smaller, the findings might reflect a perspective more aligned with females regarding LBP.

Based on the Body Mass Index (BMI), most respondents were of normal weight (59.2%), while the percentage of those underweight (30.3%) or overweight (9.2%) was relatively small. Only a few respondents were found to be obese (1.3%).

The most common source of information about LBP was from health personnel (32.9%), followed by electronic media (14.5%), mass media (22.4%), and education/school (11.8%). Most respondents

(65.8%) received information about LBP only once, while 23.7% received information 2-3 times, and 10.5% received it more than 3 times.

Regarding behavior to prevent LBP, 44.7% of respondents demonstrated positive behavior, while 55.3% exhibited negative behavior. Most respondents tended not to adopt effective prevention behaviors, such as maintaining proper posture, engaging in regular exercise, or avoiding heavy loads.

Bivariate Analysis

Bivariate analysis was conducted to determine the relationship between age, gender, and sources of information about LBP and LBP prevention behavior among students. The results of the analysis are shown in Table 2.

Table 2

Results of Bivariate Analysis

Variable	LBP Prevention Behavior				Total		p-value
	Positive		Negative				
	n	%	n	%	n	%	
Age							
>18 years	2	33.3	4	66.7	6	100	0,361
18-20 years	25	42.4	34	57.6	59	100	
21-25 years	7	63.6	4	34.6	11	100	
Gender							
Male	4	44.4	5	55.6	9	100	0,985
Female	30	44.8	37	55.2	67	100	
Body Mass Index (BMI)							
Underweight	11	47.8	12	52.2	23	100	0,694
Normal weight	19	42.2	26	57.8	45	100	
Overweight	3	42.9	4	57.1	7	100	
Obesity	1	100	0	0.0	1	100	
Source of Information about LBP							
Electronic media	9	81.8	2	18.2	11	100	0,029
Health personnel	13	52.0	12	48.0	25	100	
Education / School	3	33.3	6	66.7	9	100	
Mass media	6	35.3	11	64.7	17	100	
Other	3	21.4	11	78.6	14	100	

The chi-square test results indicate that the p-values for age, gender, and BMI are 0.361, 0.985, and 0.694, respectively, suggesting no significant relationship between these factors and LBP prevention behavior. Meanwhile, the p-value for the source of information about LBP is 0.029, indicating a significant relationship between the source of information about LBP and LBP prevention behavior.

Discussion

Student Behavior in Preventing LBP

Based on the results presented in Table 1, it was found that the majority of respondents, 42 students (55.35%), exhibited negative behavior in preventing LBP, while 34 students (44.7%) demonstrated positive behavior in LBP prevention. This discrepancy indicates a dominant tendency toward behavior less supportive of LBP prevention among students. This is a significant concern, considering that LBP is a common health issue among students due to unhealthy lifestyles, such as prolonged sitting, poor posture, or lack of regular physical activity.

The positive behaviors in this study include maintaining proper posture, regularly stretching, and paying attention to ergonomic factors in daily activities, especially when sitting at study desks or using computer devices (Kroemer & Kroemer, 2016). However, despite some respondents exhibiting positive behavior, most students tend not to pay attention to these factors. This could be due to a lack of understanding regarding the importance of LBP prevention or limited time for exercise and other physical activities that support spinal health (Slade et al., 2014; Boutevillain et al., 2017; Edward et al., 2018).

Conversely, the most common negative behaviors include sitting for extended periods without stretching, incorrect posture when studying or using electronic devices, and a lack of physical activity or exercise. These habits increase the risk of LBP, especially among students who spend significant time studying in front of computers or smartphones. Moreover, high academic stress can exacerbate posture problems and cause muscle tension in the back, ultimately contributing to the onset of LBP (Valachi & Valachi, 2003; Mei et al., 2019; Harithasan et al., 2022).

Relationship Between Age and Behavior in Preventing LBP

Age factors can influence health risks, encouraging individuals to be more concerned about their health (Cholowsky et al., 2021). Aunger (2000) also revealed that with age, individuals face increasing cultural pressures, learning experiences, and family influences, all of which shape their positive or negative behaviors. In this study, the chi-squared test results indicate a p-value of 0.361 for age, suggesting that age does not significantly influence the tendency of students to adopt either good or poor LBP prevention behavior. This finding contrasts with the results of, which showed a relationship between age and LBP prevention behavior. The findings of this study differ from those of Prawira et al. (2017), whose research reported a ρ value of 0.001 ($\rho < 0.05$), indicating a statistically significant association between age and the risk of LBP among Public Health students at Udayana University. In contrast, the results are consistent with the study conducted by González-Gálvez et al. (2020), which reported a ρ value of 0.006 ($\rho < 0.05$), also demonstrating a statistically significant relationship between age and LBP risk among students at an educational institution in Murcia, Spain.

The results in Table 2 also show that among students over 18 years of age, only 33.3% exhibited positive behavior in preventing LBP, while 66.7% showed negative behavior. The age group of 18-20 years displayed a nearly balanced distribution, with 42.4% of respondents demonstrating positive behavior and 57.6% negative behavior. Meanwhile, in the age group of 21-25 years, a higher percentage of positive behavior was observed, with 63.6%, compared to 34.6% exhibiting negative behavior. As individuals age, their level of activity tends to increase. When the body is forced to engage in activities with improper or misaligned posture, more energy is required—or wasted—to maintain that position. Consequently, excessive activities involving the lower back area carry a high risk of musculoskeletal damage, which may lead to discomfort or pain.

Although age can influence physical or health factors, this study indicates that age does not significantly affect how students respond to and prevent LBP. This might be due to factors such as uniform awareness among students, regardless of age, regarding the importance of maintaining proper posture and preventing back issues. On the other hand, LBP prevention behavior is more likely to be influenced by factors such as an individual's knowledge of back health, daily habits, academic stress levels, or more relevant social and environmental factors.

Based on these results, education or counseling on LBP prevention should be implemented uniformly across all student age groups, regardless of age (Burton et al., 2006; Suresh, 2024). In other words, educational programs about the importance of good posture, stretching, and physical activities to prevent LBP should focus on raising general awareness rather than being tailored to specific age groups. Integrated and comprehensive counseling will more effectively create positive behavior change among students without considering their age differences.

Relationship Between Gender and Behavior in Preventing LBP

According to Eckes and Trautner (2012), internal factors that can influence behavior include inherent individual characteristics, one of which is gender. Both men and women play an equal role in improving health status (Belghiti-Mahut et al., 2013). In this study, the results of the conducted tests show a p-value of 0.985 for the gender variable, which is much greater than 0.05. This indicates no significant relationship between gender and Low Back Pain (LBP) prevention behavior. This finding aligns with the research, which also obtained a p-value of 0.554, suggesting no relationship between gender and practices for preventing low back pain among students. Furthermore, Aenia, Fathimah, A., & Ginanjar (2023) also found no significant relationship between gender and low back pain complaints among workers at Dodol Boga Rasa. In contrast, the study by Rahayu & Dayanti (2021) reported a ρ value of 0.043 ($\rho < 0.05$), indicating a statistically significant relationship between gender and the risk of LBP among non-regular nursing students at STIKes Dharma Husada Bandung.

Physiologically, women's muscle strength is lower compared to men's (Hunter, 2014). Pratami et al. (2019) state that gender differences impact the risk of developing LBP. This is due to differences in muscle strength capacity. Approximately 35% of the body mass in women consists of muscle, whereas in men, it is 45%. This difference in muscle mass contributes to men having greater muscular endurance than women, resulting in a higher risk of LBP among women. Additionally, Ramadhani & Wahyudati (2015) stated that hormonal differences between women and men also influence the risk of LBP. Women have higher estrogen levels, a hormone that plays a crucial role in protecting muscle tissue. On the other hand, men have higher levels of testosterone, which is responsible for building muscle mass and strength (Sialino et al., 2022; Pang et al., 2023).

In Table 2, it is also observed that in the male group, 44.4% exhibit positive behavior, while 55.6% demonstrate negative behavior. In the female group, 44.8% exhibit positive behavior preventing LBP, while 55.2% demonstrate negative behavior. This slight difference indicates that gender does not significantly affect students' behavior in preventing LBP, which is consistent with the statistical tests showing no significant relationship between gender and LBP prevention behavior.

These results suggest that males and females tend to exhibit similar behavior patterns regarding LBP prevention, with no significant differences between them. Although biological differences between genders may affect certain aspects of physical health, gender is not a primary determinant factor in LBP prevention (Sialino et al., 2022). This may be due to uniform awareness regarding the importance of maintaining good posture and preventing back injuries, which is not influenced by gender differences.

Relationship Between Body Mass Index (BMI) and Behavior in Preventing LBP

Body Mass Index (BMI) is a measure used to compare an individual's weight to their height. BMI helps categorize body proportions into categories such as underweight, normal, overweight, and obesity (Mohajan & Mohajan, 2023)

The analysis results indicate that the p-value for BMI is 0.694, which suggests no significant relationship between BMI and LBP prevention behavior. This finding is consistent with the study, which also showed no significant relationship between body mass index and the occurrence of behaviors related to preventing low back pain. The research by Karlina et al. (2022) also revealed no significant relationship between BMI and low back pain among workers at Panglong in Saketi District, where the statistical test resulted in a p-value of 0.605 ($p > 0.05$), indicating no relationship between BMI and low back pain. In contrast, the study by Negara et al. (2017) reported a ρ value of 0.01 ($\rho < 0.05$), indicating a statistically significant relationship between the overweight BMI category and the risk of LBP among medical students at Udayana University.

Table 2 also shows that respondents in the underweight category exhibited the highest percentage of positive behavior, 47.8%, compared to the normal weight category (42.2%) and the overweight category (42.9%). In the obesity category, all respondents (100%) exhibited positive behavior in preventing LBP, although the number of respondents in this category was minimal, with only one person.

Increased body weight results in additional strain on the lumbar vertebrae, disturbing the spinal structure and increasing the risk of lower back pain. In individuals who are overweight, fat accumulation in the abdominal area can cause an imbalance between the abdominal muscles and the back muscles. The abdominal muscles tend to weaken, while the back muscles experience tension due to the added load. This condition causes the back muscles to work harder, particularly in the L1-S5 region, which supports about 75% of body weight (González-Gálvez et al., 2020). Prolonged tension in the back muscles can lead to muscle fatigue or mechanical stress, ultimately triggering pain (Allegri et al., 2016).

Relationship Between Sources of Information About LBP and Behavior in Preventing LBP

The availability of information is an essential factor that can influence individual behavior. Research conducted by Claassen et al. (2010) shows that the more information individuals receive, the higher their awareness of the importance of preventing a disease.

Based on the Chi-Square test results, a p-value of 0.029 was obtained for the source of information about Low Back Pain (LBP), indicating a significant relationship between the source of information about LBP and LBP prevention behavior. This means that the type of information source available to students affects their attitudes and behaviors in preventing LBP. This significant relationship indicates that students who receive information about LBP from more credible and trustworthy sources, such as medical professionals, lecturers, or research-based sources, are more likely to exhibit positive behaviors in preventing LBP. A good source of information can provide a clearer understanding of the importance of maintaining proper posture, stretching, and other habits that can reduce the risk of LBP. Conversely, students who obtain information from less reliable or inappropriate sources may not understand the importance of LBP prevention and are thus more likely to ignore the necessary preventive behaviors.

The research results in Table 2 also show that respondents who received information about LBP from electronic media exhibited very high positive behavior, with 81.8% of respondents in this group taking appropriate preventive actions, while only 18.2% did not. On the other hand, the group receiving information from healthcare professionals showed 52% positive behavior and 48% negative behavior. Respondents who obtained information from education/school showed 33.3% positive behavior, while

66.7% displayed negative behavior. Information from mass media tended to result in more negative behaviors, with 64.7% of respondents exhibiting negative behavior and only 35.3% showing positive behavior. Other unspecified sources had a higher proportion of negative behavior, with 78.6% of respondents demonstrating behaviors that did not support LBP prevention and only 21.4% exhibiting positive behavior.

The role of information sources in raising awareness about LBP is crucial because accurate and relevant information can influence knowledge, attitudes, and, ultimately, individual behavior. In this context, the research results indicate that education and counseling delivered through appropriate channels can result in significant behavioral changes (García-Martínez et al., 2022). For example, counseling from medical professionals or health campaigns conducted by universities can help students understand the practical steps to prevent LBP and encourage them to pay more attention to everyday habits related to back health.

Conclusions and Implications

Overall, the research findings show that age and gender factors do not significantly influence LBP prevention behavior among students. However, the variable of information sources about LBP has proven to be significantly related to prevention behavior, with students receiving information through electronic media being more likely to take appropriate preventive actions. Additionally, although Body Mass Index (BMI) tends to influence prevention behavior, its impact is not as significant as the more decisive influence of information sources.

The implications of the results of this study indicate that although age and gender do not significantly influence LBP prevention behavior among university students, the source of information received plays a significant role. Students who access information about LBP through electronic media tend to be more active in taking appropriate preventive measures. Therefore, to increase awareness and prevention of LBP, it is essential for relevant parties, such as educational institutions or health institutions, to improve the distribution of accurate and easily accessible information through electronic platforms. In addition, although BMI influences preventive behavior, the information source factor remains dominant in influencing students' awareness.

Suggestions for Future Research

Based on the findings of the present study, several recommendations are advanced to enhance awareness and preventive behaviors regarding low back pain (LBP) among university students. Although age and gender did not exert a significant influence on LBP prevention behaviors, the source of information emerged as a critical factor. Students who accessed LBP-related information via electronic media such as educational videos or online articles demonstrated a higher likelihood of engaging in appropriate preventive measures. Consequently, it is advisable for universities and academic faculties to prioritize electronic media as the principal channel for disseminating information on LBP prevention. Implementing targeted online campaigns that emphasize the importance of maintaining correct posture and offer practical strategies for daily LBP prevention may prove effective. Furthermore, educational content should be disseminated through social media platforms and mobile applications frequently utilized by students. In addition to these digital interventions, organizing interactive workshops or training sessions is recommended to deepen students' understanding of spinal health and to equip them with actionable preventive techniques. By adopting a technology-driven approach combined with fostering active student participation, the potential for improving LBP prevention behaviors is substantially increased. Such efforts are anticipated to mitigate the incidence of LBP-related injuries and enhance students' overall quality of life.

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Conflicts of Interest

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