

# Factors Affecting Lower Back Pain (LBP) among Undergraduate Nursing Students

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**Keywords:** Lower Back Pain, Nursing Students, Biological Factors, Psychological Factors, Social Factors.

**Abstract:** Introduction: The earlier young people experience lower back pain (LBP), the more potential there is to acquire chronic back pain in the future. Nursing is a high-risk job regarding LBP. Knowing the factors that affect the occurrence of LBP in nursing students is important to prevent LBP when working as a nurse later. Methods: This study analyzed the factors that influence the occurrence of LBP in nursing students at the Faculty of Nursing, Universitas Airlangga. A stratified random sampling method was used. This study was a cross-sectional study with questionnaires as the method for data collection, and a logistic regression test for data analysis. The sample comprised of 120 undergraduate nursing students. The independent variables were factors influencing the occurrence of LBP: biological, psychological, and social factors. The dependent variable was the occurrence of LBP during the last 12 months. Results: As many as 60% of students experienced LBP in the last 12 months and significant factors affecting LBP were: history of spinal trauma ( $p = 0.023$ ), stress level ( $p = 0.000$ ), sports habits ( $p = 0.044$ ), and motor vehicle usage ( $p = 0.033$ ). Conclusions: Biological, psychological, and social factors influence the occurrence of LBP in nursing students. Avoiding factors affecting LBP may reduce the prevalence and impact of LBP in the nursing profession.

## 1 BACKGROUND

Symptoms of lower back pain (LBP) or perceived pain in the lower back region (Wulandari, 2014) is major causes of disability, absenteeism, and poor performance at work (Novitasari et al., 2016). Most of the research on LBP is performed in adults engaged in certain types of work, so there is little understanding of the onset of early LBP among adolescents and young adults (Heuscher et al., 2007). The incidence of LBP in the early stages of life increases the chronic, recurrent risk of LBP, which potentially reduces the efficiency of the young population (Study et al., 2017).

Anderson (1999) estimates the prevalence of LBP in the world at 30% (Study et al., 2017). Research in Perth (Australia), shows that more than 30% of nursing students in clinical education have experienced LBP in the past 12 months (Mitchell et al., 2009). In Indonesia, the number of LBP patients is not known, but it is estimated to be between 7.6% to 37% (Lailani, 2013). The prevalence of LBP in nurses in Jakarta is around 61.1% (Kurniawidjaja et al., 2013). The researchers conducted a preliminary

study in September 2017 with 16 undergraduate nursing students at Universitas Airlangga (Unair) who had not undergone professional education, aged 17–35 years. It was determined that 12 students had suffered with LBP during the last 12 months, but the factors affecting LBP are still inexplicable.

The risk factor for LBP is a multifactorial biopsychosocial problem (Mitchell et al., 2009). Biological factors that can affect the occurrence of LBP are biomechanics, the central nervous system, and personal factors. A psychological factor that can cause LBP is stress. Social factors, such as smoking, backpack use, driving, sports habits, and environmental factors, including mattress used, can also cause LBP (Farrokhi et al., 2017).

According to a preliminary study, all Unair nursing students complained about the severity of academic demands. Purwati (2012) states that the demands of academic work cause students to experience stress that can have a negative impact such as starting smoking. Time demand lectures and tasks increase the duration of sitting so there is a decrease in physical activity. The results of a study by Idyan (2005) regarding extension students at the

Faculty of Nursing Universitas Indonesia, of 35 respondents who sat in every lecture for 1–3 hours, 51.4% experienced severe pain (Saputra, 2009). The majority of Unair nursing students say the demands of the tasks cause them to stay up late, so they consume coffee to relieve drowsiness. Unair nursing students often carry heavy bags containing a laptop, medical books, and lecture notes. The majority of Unair students live in the boarding houses and most of them complain about their uncomfortable mattresses. The characteristics of Surabaya as a big city causes congestion on the road. Congestion results in an increase in travel time and increased psychological stress (Tondok, 2009). All Unair nursing students usually use private vehicle transportation (cars and motorcycles), because they feel more safe and comfortable.

In Indonesia, there are still limited studies on risk factors for LBP. This is important to discuss because work and lifestyles in Indonesia are not the same as in places abroad (Kurniawidjaja et al., 2013). Discussion about risk factors of LBP among nursing students who have not undergone clinical education is important based on the high incidence of LBP in previous research. Therefore, before starting work as a nurse, attempts to prevent LBP should be carried out. Based on the description above, the researcher is interested in analyzing the factors that affect the occurrence of LBP in students at the Faculty of Nursing, Universitas Airlangga.

## 2 METHODS

This research was carried out using a cross-sectional design, using binary logistic regression statistic test to measure the influence of the independent variable on the dependent variable with the degree of significance  $p < 0.05$ . The population of this research were bachelor students from the Faculty of Nursing at Universitas Airlangga (Unair), who were active students, aged 1-35 years, with experience of LBP or not in the last 12 months, and not currently undergoing clinical education. The total sample was 120 respondents selected by simple stratified random sampling. This research already has ethical approval by the Ethical Committee for Health Research at Universitas Airlangga, No: 582-KEPK.

The independent variables of this study were factors that influence the occurrence of LBP with biological factors (age, BMI, history of spinal trauma, and family disease history associated with LBP), psychological factors (stress level), social factors (sitting habits, exercise habits, smoking,

coffee consumption, use of bags, use of mattresses, and use of motor vehicles). The dependent variable was the incidence of LBP over the past 12 months. The research instrument was modified from the Nordic Low Back Pain questionnaire (Kuorinka et al., 1987) to measure the incidence of LBP in the last 12 months and the risk level of disability, depression anxiety stress scale (DASS) 42 (Psychology Foundation of Australia, 2014) to measure social factors, and the modified questionnaire from previous studies by Korovessis (2010) and Widiasih (2015) to measure biological and social factors.

## 3 RESULTS

The population sample represents 16.67% of the study. Table 1 illustrates the demographic characteristics of the population. There are 20 respondents per class and most are female (81.7%). Most respondents had experienced LBP during the last 12 months (60%).

Table 2 shows the results of the distribution of data measured regarding the biological, psychological, and social factors of the respondents. In relation to biological factors, most respondents, in the final adolescent age range (90%), had a normal BMI (65.8%), had never had a spinal trauma (91.7%), and had no family disease history associated with LBP (95.8%). In relation to psychological factors, most respondents experienced a normal stress level (40%). For social factors, most respondents sat for 6–9 hours per day (66.7%), took part in sports <2 hours per week (31.7%), did not

Table 1: Demographic data of respondents

No	Characteristics	Frequency	%
1.	Class year		
	4 <sup>th</sup> year	20	16.7
	3 <sup>rd</sup> year	20	16.7
	2 <sup>nd</sup> year	20	16.7
	1 <sup>st</sup> year	20	16.7
	2 <sup>nd</sup> year (extension)	20	16.7
	1 <sup>st</sup> year (extension)	20	16.7
	Total	120	100
2.	Age		
	Male	22	18.3
	Female	98	81.7
	Total	120	100
3.	The LBP incident in the last 12 months		
	Never experienced	48	40.0
	Ever experienced	72	60.0
	Total	120	100

smoke (96.7%), did not consume coffee (62.5%), used bags with two shoulders straps (85.8%), described the bag as having a normal weight (55%), carried bags for 10–20 minutes (30.8%), described their mattresses with medium description (60%), and used motor vehicles for around 20–40 minutes per day (29.2%).

Table 3 shows the results of the logistic regression test; the factors that significantly influence the occurrence of LBP are the history of spinal trauma (biological factor), stress level (psychological factor), sports habits and the use of motor vehicles (social factors). The magnitude of influence can be shown by the value of the Odds Ratio (OR). The result of data analysis indicates that the greater history of spinal trauma, the higher chance of LBP, the higher the stress level, the higher chance of LBP, the longer time exercising time in

one week, the lower chance of LBP, the longer the driving time, the higher likelihood of LBP. From the logistic regression analysis, it is clear that the history of spinal trauma is the most dominant factor affecting the incidence of LBP.

## 4 DISCUSSION

### 4.1 Analysis of the Influence of Biological Factors on the Occurrence of LBP

Analysis on the biological effects of age, BMI, history of spinal trauma, and family history of LBP is discussed in this section.

Table 2: The Measurements of Variable Data Distribution in the Biological, Psychological, and Social Factors of Respondents.

Measured Variables	Category	LBP the last 12 months		f	%
		No	Yes		
Biological Factors Age	Early adolescents (12–16 years old)	0	0	0	0
	Teenagers (17–25 years old)	45	63	108	90.0
	Early Adult (26–35 years old)	3	9	12	10.0
BMI	Very thin (BMI <17)	1	3	4	3.3
	Thin (BMI 17–18,4)	7	10	17	14.2
	Normal (BMI 18.5–25)	35	44	79	65.8
	Fat (BMI 25,1–27)	4	3	7	5.8
	Very Fat (BMI > 27)	1	12	13	10.8
History of Spinal Trauma	Never experienced	48	62	110	91.7
	Ever experienced	0	10	10	8.3
Medical diagnosis of respondents who have experienced spinal trauma	Minor injury	-	-	3	2.5
	Dislocation	-	-	2	1.7
	Fracture of the sacrum	-	-	1	0.8
	LBP	-	-	1	0.8
	Spondylolisthesis	-	-	1	0.8
	Lumbar muscle spasms	-	-	1	0.8
	Coccydynia	-	-	1	0.8
Family Disease History Associated with LBP	Chronic LBP	0	1	1	0.8
	Osteoarthritis <50 years of age	1	2	3	2.5
	Disk hernia	0	0	0	0
	Spinal form disorders	1	0	1	0.8
	None	46	69	115	95.8
Psychological Factor Stress Level	Awful	0	8	8	6.7
	Severe	0	19	19	15.8
	Medium	5	22	27	22.5
	Light	8	10	18	15.0
	Normal	35	13	48	40.0

Table 2: The Measurements of Variable Data Distribution in ... (continued)

Measured Variables	Category	LBP the last 12 months		f	%
		No	Yes		
Biological Factors Age	Early adolescents (12–16 years old)	0	0	0	0
	Teenagers (17–25 years old)	45	63	108	90.0
	Early Adult (26–35 years old)	3	9	12	10.0
BMI	Very thin (BMI <17)	1	3	4	3.3
	Thin (BMI 17–18.4)	7	10	17	14.2
	Normal (BMI 18.5–25)	35	44	79	65.8
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	Very Fat (BMI > 27)	1	12	13	10.8
History of Spinal Trauma	Never experienced	48	62	110	91.7
	Ever experienced	0	10	10	8.3
Medical diagnose on respondents who had experienced spinal trauma	Minor injury	-	-	3	2.5
	Dislocation	-	-	2	1.7
	Fracture of the sacrum	-	-	1	0.8
	LBP	-	-	1	0.8
	Spondylolisthesis	-	-	1	0.8
	Lumbar muscle spasms	-	-	1	0.8
Family Disease History Associated with LBP	Coccydynia	-	-	1	0.8
	Chronic LBP	0	1	1	0.8
	Osteoarthritis <50 years of age	1	2	3	2.5
	Disk hernia	0	0	0	0
	Spinal form disorders	1	0	1	0.8
Psychological Factor Stress Level	None	46	69	115	95.8
	Awful	0	8	8	6.7
	Severe	0	19	19	15.8
	Medium	5	22	27	22.5
	Light	8	10	18	15.0
	Normal	35	13	48	40.0

#### 4.1.1 The Influence of Age

Age did not have a significant effect on the occurrence of LBP, which is not in accordance with the assertion that the older a person becomes, the greater the risk of LBP due to bone degeneration. At the age of 30 years, degeneration occurs in the form of tissue damage (Andini, 2015). The onset of bone degeneration cannot be prevented, but LBP can be prevented by strengthening bone and muscle structure. Exercise and nutritional balance can maintain the strength of the musculoskeletal system (Gabr & Al-eisa, 2017). Differences in previous research could be caused by the definition of early adulthood beginning at the age of 26 in this study, so it can be concluded that respondents aged less than 30 years have not risked the occurrence of bone degeneration that can cause bias in the early adult age range. Age factors still need to be considered to prevent early bone degeneration in college students.

#### 4.1.2 The Influence of BMI

Results showed that BMI did not affect the occurrence of LBP. This was relevant to a previous study by Koley et al. (2010) in India and Mangwani et al. (2010) in the UK showed no significant difference between BMI and LBP (Lailani, 2013). The result study by Yasin et al. (2010) in RSDS Surabaya indicates that BMI influences the occurrence of LBP. Increased BMI can weaken abdominal muscles, so that the center of gravity is pushed to the front of the body causing an increase in lumbar lordosis and fatigue in the paravertebral muscle. The mismatch of the research results to the theory may be influenced by the respondents' increased time spent sitting; the burden of the abdomen is sustained by the thigh, so it will not burden the spine.

Table 3: Bivariate Test Results Between Independent and Dependent Variables.

	B	P value	OR
Biological Factors			
BMI	-0.221	0.592	0.801
Age	-1.275	0.228	0.280
History of Spinal Trauma	3.275	0.023	26.4
Family Disease History	-0.441	0.414	0.643
Psychological Factors			
Stress Level	1.550	0.000	0.212
Social Factors			
Sitting habits	-1.051	0.145	0.349
Physical Exercise	-0.852	0.044	0.427
Smoking	-2.020	0.188	0.133
Drinking coffee	-0.120	0.833	0.887
Carrying Bag			
Carrying style	-1.779	0.087	0.169
Weight	-0.800	0.144	0.449
Duration	-0.230	0.373	0.794
Matrass	0.271	0.659	1.31
Transportation from and to campus	-0.620	0.033	0.538

#### 4.1.3 Influence of History of Spinal Trauma

The results indicated that the history of spinal trauma influenced the occurrence of LBP; the more history of spinal trauma, the higher chance of LBP occurrence. Hendri (2014) also states that a history of back injury has a risk of LBP 1.95 times greater than with no history. The spine has an extremely sturdy and stable structure (Standing, 2016). The intervertebral discs form a strong joint that allows the spine to move and support a heavy burden (Widiasih, 2015). Spinal trauma may alter the structure of the spine, but the recovery system of the spinal structure may support its regeneration (Munir, 2012). Most respondents are late adolescents so the backbone should still be able to regenerate optimally. The backbone is a solid unit, but in the results of bone trauma studies can cause LBP. This may be because the respondents' history of spinal trauma is so severe that it causes damage to the backbone structure, causing LBP to occur.

#### 4.1.4 Influence of Family Disease History

The results showed that family history did not affect the occurrence of LBP. The results did not match the assertion that some elements of genetic factors that can affect the occurrence of LBP, include the receptor elements of vitamin D, VDR, COL1,

COL9, and Aggrecan. Matsui et al. (1997) suggest that family history of disc herniation has a significant relationship to the occurrence of Discus Degenerative Disease with vitamin D receptors as one of the disposition genes. VDR plays a role in normal bone mineralization and remodeling. Osteoarthritis is associated with the VDR gene. COL1 and COL9 play a role in facilitating the stress of the intervertebral discs. Aggrecan acts as a fluid binder that keeps nucleus pulposus well hydrated (Hemanta et al., 2016). Genetic factors also contribute to sensitivity to pain, such as the disorder of the spine (scoliosis), and degeneration of the discus (Wong et al., 2017). The differences with the theory may be caused by only a minority of respondents who have a family history of disease associated with LBP. Most respondents never experienced spinal cord injury, so the spinal structure should not be disturbed. Also, most respondents were in the late adolescent age range. However, it is necessary to be more vigilant if you have parents who have a family history of illness that can affect the occurrence of LBP.

#### 4.2 Analysis of the Influence of Psychological Factors on the Occurrence of LBP

Most respondents experienced stress. Stress levels stress affect the occurrence of LBP; the higher the level of stress, the higher the chance of LBP occurrence. Research by Purwati (2012) in FIK UI shows that nursing students have high stress levels. Stress is a psychological factor that can cause LBP (Farrokhi et al., 2017). Stress can cause pain through increased spinal mechanical load due to increased muscle tension (Mitchell et al., 2009). This study did not measure the causes of stress, but based on preliminary studies, stress was caused by heavy academic demands. Stress on Unair nursing students needs to be anticipated. Stress can directly affect the onset of symptoms of disease, e.g. LBP, but stress can also cause various behaviors that can trigger the occurrence of LBP, such as smoking.

#### 4.3 Analysis of the Influence of Social Factors on the Occurrence of LBP

Analysis on the social influences of length of time sitting, exercise habits, smoking, coffee consumption, the use of bags, mattress description, and the length of time using motor vehicles compared with the occurrence of LBP are discussed in this section.



### 4.3.1 The Influence of Time Spent Sitting

The results showed that Unair nursing students regularly sat for 6–9 hours but the habit of sitting did not significantly affect LBP occurrence. The results do not match previous studies. Matthews et al. (2012) states that sitting for 6–9 hours a day increases the risk of LBP and sitting more than 9 hours a day is classified as too long sitting (Van der Ploeg et al., 2012). Sitting for a long time can reduce lubrication in the joints, causing stiffness (Widiasih, 2015). Continuous seated work causes muscle contraction to become static and causes repetitive muscle loading, which blocks blood flow, so that the oxygen supply is insufficient for aerobic metabolism. This condition causes accumulation of lactic acid accumulation and body heat, ultimately causing skeletal muscle fatigue in a form of muscle satisfaction.

The mismatch of the study and the theory may be because respondents who sit for shorter lengths of time are likely to have other LBP risk factors that may cause bias on the results. This study also did not measure how the length of time sitting, posture, and ergonomic modelled seating commonly used by students. Anatomically, sitting in a non-upright position and frequently changing the sitting posture reduces the load between bone segments, and provides a disc of time to enter water and nutrients to keep the disc moist and regenerate in the form of collagen tissue therein. Students' sitting habits require special attention, considering most sit for 6–9 hours daily. It is advisable not to sit for more than six hours a day, and if there is no choice, it is important to stretch and change position as often as possible during sitting.

### 4.3.2 The Influence of Exercise Habits

Most respondents only exercise <2 hours per week, and exercise has a significant effect on the occurrence of LBP. The results of data analysis showed that the longer exercise time in one week, the lower the chance of LBP occurrence. The results are consistent with the assertion that exercise can increase the strength and flexibility of the spinal support muscles, so regular exercise can reduce the risk of LBP (Kurniawidjaja et al., 2013). Korovessis et al. (2010) also state that more frequent exercise (> 6 hours per week) showed a lower incidence of LBP than for those not exercising. Regular exercise can improve the quality of life, prevent osteoporosis and various diseases of the skeleton and other diseases (Andini, 2015). Respondents who exercised for longer did not experience LBP, i.e. with frequent

sports such as jogging, dancing, and gymnastics. This type of exercise not only increases muscle and bone strength, but can also train and maximize flexibility between joints, so that the structure of the spine is stronger and the spine's ability to hold the load can increase.

### 4.3.3 The Influence of Smoking

According to the results, smoking does not affect the occurrence of LBP, which is not supported by some previous studies. Hemanta et al. (2016) suggest that smoking can lead to reduced blood flow to the vertebral body, and lower bone mineral content, which promotes intervertebral disc degeneration. Nicotine also induces irreversible disc degeneration. The mismatch with previous studies could be because almost all respondents were not smokers. There is an absence of measurements as to how long the respondent had smoked, nor is there any literature that states whether the length of time smoking can affect LBP; the rare frequency of smoking could also cause bias on the results.

### 4.3.4 The Influence of Coffee Consumption

Results showed that coffee consumption had no significant effect on the occurrence of LBP, which differ from the opinion of Hallstrom (2010) who states that coffee consumption can accelerate bone degeneration. Coffee consumption more than three times per week had a higher risk (88%) of LBP (Huang et al., 2014). Caffeine helps in overcoming fatigue and drowsiness and reduces pain, but Currie (1995) states the importance of reducing coffee intake, because caffeine contributes to the modulation of pain perception in various acute pain states. Caffeine also increases urinary calcium and may have long-term adverse effects on bones (Alshagga et al., 2013). Until now there is still no literature that states how much coffee should be consumed to cause the risk of LBP. The Dietary Guidelines Advisory Committee recommends no more than 400 mg/day of coffee (equivalent to 3–5 cups). The maximum coffee drinking limit has different effects on individuals, such as heart palpitations, nausea, and vomiting (Sass, 2015).

Coffee has beneficial effects but also has long-term effects that are very harmful, so the coffee-drinking habits of nursing students should be anticipated. This must be individualised as everyone has different toleration of coffee. The mismatch with previous research could be because this study does not measure the concentration level of coffee consumed per cup and how long the students

consume coffee for, so further research on the level of coffee concentration and duration of coffee consumption should be conducted to determine how that may affect LBP occurrence.

#### 4.3.5 Effect of Bag Usage

The results of carrying a bag, the bag's weight and the length of time carrying the bag have no significant effect on LBP occurrence. This was a different opinion to that of Korovessis et al. (2010) who state in their study that backpacks with one or both shoulders cause LBP. Aggarwal (2017) states that an increase in bag load can explain the increase in LBP. Korovessis et al. (2010) state that high school students in Greece show that the use of bags with heavy descriptions has the highest significance value compared with the description of normal or very heavy bags. The use of backpacks for 40–60 minutes has a higher significance value compared to <40 minutes.

The mismatch with previous studies could be because most respondents only carry their bags for 10–20 minutes. Respondents often use vehicles to travel to the campus and usually put their bags on chairs or on the floor when they arrive at the campus, reducing the duration of time carrying bags. The data also determines that Unair nursing students who carry bags >1 hour per day do not experience LBP, which is different to the theory. This could be because students carrying bags for longer may only be carrying lighter loads.

#### 4.3.6 Effect of Mattress Description

The results showed that the types of mattress used did not have a significant effect on the occurrence of LBP. This is different to the opinion of Korovessis et al. (2010) who states that a hard mattress has a significant effect on the incidence of LBP in school students. A hard bed will cause static and recurrent muscle loading causing blocked blood flow, resulting in insufficient oxygen supply for aerobic metabolism. This condition causes the accumulation of lactic acid accumulation and body heat, ultimately causing skeletal muscle fatigue (Widiasih, 2015).

The use of appropriate mattresses in most respondents caused the mismatch with previous research, which states that a hard mattress significantly affects the occurrence of LBP. Based on raw data of respondents who perceived a hard mattress experienced LBP This is in sharp contrast to previous theories that suggest that a soft mattress will reduce muscle tension. Based on this, it can be attributed as a cause of LBP; multifactorial and

biopsychosocial approaches can also explain the occurrence of LBP, i.e. biological, psychological, and social factors are interrelated.

#### 4.3.7 Influence of the Use of Motor Vehicles

The results showed that the duration of using motor vehicles in a day can affect the occurrence of LBP: the longer the driving time, the higher the chance of LBP occurrence. This is consistent with claims that driving with a vibrating vehicle (car or motorcycle) has the potential to generate LBP. Vibration may cause increased muscle contractions resulting in poor blood circulation, accumulation of lactic acid, and pain (Andini, 2015). Complaints of LBP will be felt after six months, if motorcyclists routinely drive every day for at least 2.5 hours (Saputra, 2009).

Based on preliminary studies, most respondents travel on motorcycles and carry heavy bags, which will further increase the burden and pressure on the lower back and increase the risk of LBP. This research does not link motorcyclists and motorists to LBP, but almost all students travel to work on motorcycles, so it can be generalized that the duration of driving on motorbikes might influence the occurrence of LBP. This study did not measure how long the students had been driving a motor vehicle: it could be that nursing students had used motor vehicle since high school, or since becoming a student, junior high school or even elementary school, so this needs further consideration to achieve more accurate results.

## 5 CONCLUSIONS

The results reinforce the previous theory that LBP is a biopsychosocial problem. Factors influencing the occurrence of LBP in nursing students of Universitas Airlangga can be based on biological factors, such as the history of spinal trauma, psychological factors such as stress levels, on social factors, such as sport habits and motor vehicle usage. The most dominant factor of LBP is the history of spinal trauma. It is suggested that nursing students prevent factors affecting LBP, and further research related to LBP is also recommended.

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