Association Between Body Mass Index and Low Back Pain Among Students at The Faculty of Medicine, Pelita Harapan University

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Abstract

Background: Low back pain (LBP) is the most common musculoskeletal complaint and the largest contributor to the burden of disability in the world. One of the risk factors for LBP is having higher body mass index (BMI). Although the relationship between BMI and LBP in the age group susceptible to LBP has been widely studied, the relationship in the young adult age group is still under-researched. Meanwhile, several studies report that lifestyle changes that occur during the COVID-19 pandemic might lead to an increasing number of overweight-obese sufferers, including in the young adult age group. Given the context, this research aims to determine the relationship between BMI and LBP in UPH Medical Faculty (FK UPH) students during the COVID-19 pandemic.

Method: A cross-sectional method of unpaired categorical comparative analytical study design was conducted with a population of 414 medical students. Data were collected by an online survey of BMI measurement and Nordic Musculoskeletal Questionnaire. Statistical analysis was done using SPSS Statistics with Chi-squared or Fischer's exact method.

Result: The study involved a sample of 372 people with 188 people (50.5%) being LBP sufferers. Most of the sample belong to the category of BMI < 23 kg/m2, which is 215 people (57.8%).

Conclusion: The result from this research concludes that there is no significant relationship between BMI and LBP in FK UPH students during the COVID-19 pandemic (P = 0.420); significant relationships were found between LBP with gender (P = <0.001) and smoking habit (P = 0.022).

Introduction

Low back pain (LBP) is the most common musculoskeletal complaint in the world with a prevalence reaching 568 million people, reported by *Global Burden of Disease, Injuries, and Risk Factor Study 2019* (GBD 2019). The same study reported LBP as the main cause of disability since 1990.[1] LBP is the leading cause of activity limitation and absenteeism from work, which results in a large medical and economic burden.[2] LBP is also the most common concomitant condition in patients with neuropathic pain in Indonesia based on a study by the *Indonesian Neurological Association*.[3]

Overweight and obesity are risk factors for LBP.[4,5] One cross-sectional study showed the percentage of LBP sufferers increased with an increase in body mass index (BMI) as follows: 47.5% were underweight and normal; 51.8% overweight group; 52.6% of the obese I group; 55.4% for the obese II group; and 72.8% in theobese III group.[6] Another cross-sectional study also found an increased prevalence of persistent LBP in the group with high BMI rates and low levels of physical activity.[7]

The relationship between BMI and LBP in the vulnerable age group for LBP (30-50 years old) has been extensively studied in previous studies, but the relationship between the two in the young adult age group (18-24 years old) is still under-researched. GBD 2019 reports that the 25-49 years old age group bears the most burden of disability from LBP, however the burden of disability in the 10-24 years old age group is currently experiencing a significant increase.[8]

Poor sleep quality, snacking after dinner, irregular eating patterns, eating in response to stress and decreased physical activity are suspected to cause the increasing number of overweight and obese sufferers during the COVID-19 pandemic.[9] This phenomenon also occurs in the young adults, where 32% of university students who participated in a research conducted in Saudi Arabia experienced weight gain during the pandemic lock-down.[10]

Material And Methods

A *cross-sectional* study was conducted on-line using *Google Form* within the range of Faculty of Medicine, Pelita Harapan University from January 2022 to May 2022. It was an unpaired categorical comparative analytical study, that aims to determine the relationship between BMI groups and prevalence of LBP using *Nordic Musculoskeletal Questionnaire.* The obtained data would be tabulated using *Microsoft Excel* 2019, then analyzed with *Chi-squared* method using SPSS *Statistics*.

The criteria of inclusion in this study were pre-clinical students of the Faculty of Medicine in Pelita Harapan University, aged between 18-24 years old, and had given approval of *informed consent* to participate in the study. Respondents with a history of LBP precipitating diseases and/or a history of low back injuries were excluded from this study.

Result

Of the 414 respondents who participated in this study, there were 372 respondents who met the criteria as the research sample. The results of the Nordic Musculoskeletal Questionnaire showed that 188 (50.54%) people had LBP, while 184 (49.46%) people did not. Categorized BMI based on the Asia-Pacific standard showed that the largest sample distribution was in the normal weight category with 161 (43.28%) people and the smallest in the underweight category with 54 (14.52%) people. A more comprehensive presentation of sample characteristics can be seen in Table 1 as presented below.

Table 1. Sample Characteristics

Characteristics	Frequency (n=372)
Gender	
Male	112 (30,1%)
Female	260 (69,9%)
Low Back Pain	
Yes	188 (50,5%)
No	184 (49,5%)
Body Mass Index (Asia-Pacific Classification)	
Underweight	54 (14,5%)
Normal weight	161 (43,3%)
Overweight	68 (18,3%)
Obese	89 (23,9%)
Smoking Habit	
Yes	26 (7,0%)
No	346 (93,0%)
Level of Physical Activity	
Inactive	338 (90,9%)
Minimally active	34 (9,1%)
HEPA active	0 (0%)
Sitting Duration per Day	
<6 hours	179 (48,1%)
≥6 hours	193 (51,9%)

Table 2 shows the results of statistical tests to determine the existence of a significant relationship ($P > 0.05$) between BMI and LBP in respondents.

Tabel 2. Association Between Low Back Pain and Body Mass Index

Body Mass Index	Low Back Pain		Total	OR (95% CI)	P-value
	Yes	No			
IMT<23	113 (52,6)	102 (47,4)	215	0,826 (0,547-1,246)	0,420
IMT ≥23	75 (47,8)	82 (52,2)	157		
Total	188 (50,5)	184 (49,5)	372		

Table 3 shows the results of statistical tests to determine the existence of a significant relationship (*P* > 0.05) between gender and LBP in respondents.

Tabel 3. Association between low back pain and gender

Gender	Low Back Pain		Total	OR (95% CI)	P-value
	Yes	No			
Male	41 (36,6)	71 (63,4)	112	2,253 (1,428-3,554)	<0,001
Female	147 (56,5)	113 (43,5)	260		
Total	188 (50,5)	184 (49,5)	372		

Table 4 shows the results of statistical tests to determine the existence of a significant relationship (*P* > 0.05) between smoking habit and LBP in respondents.

Tabel 4. Association between low back pain and smoking habit

Smoking habit	Low Back Pain		Total	OR (95% CI)	P-value
	Yes	No			
Yes	7 (26,9)	19 (73,1)	26	0,336 (0,138-0,819)	0,022
No	181 (52,3)	165 (47,7)	346		
Total	188 (50,5)	184 (49,5)	372		

Table 5 shows the results of statistical tests to determine the existence of a significant relationship (*P* > 0.05) between level of physical activity and LBP in respondents.

Tabel 5. Association between low back pain and level of physical activity

Level of physical activity	Low Back Pain		Total	OR (95% CI)	P-value
	Yes	No			
MET < 600	170 (50,3)	168 (49,7)	338	1,112 (0,549-2,253)	0,909
MET ≥ 600	18 (52,9)	16 (47,1)	34		
Total	188 (50,5)	184 (49,5)	372		

Table 6 shows the results of statistical tests to determine the existence of a significant relationship (*P* > 0.05) between sitting duration per day and LBP in respondents.

Tabel 5. Association between low back pain and sitting duration per day

Sitting duration per day	Low Back Pain		Total	OR (95% CI)	P-value
	Yes	No			
< 6 hours	85 (47,5)	94 (52,5)	179	1,266 (0,842-1,902)	0,303
≥ 6 hours	103 (53,4)	90 (46,6)	193		
Total	188 (50,5)	184 (49,5)	372		

Discussion

In this study, no significant relationship was found between BMI and LBP (P = 0.420). Previous studies have obtained mixed results regarding the relationship between the two variables. A study by Alhowimel et al. obtained similar results in finding no significant association between BMI and LBP.[11] Another study by Koley et al. only found a significant association between LBP and height and weight separately, but no significant association with BMI.[12] Moreover, Hershkovich et al. found in their study that high BMI and height were significantly associated with the occurrence of LBP in adolescents in Israel.[13] These conflicting results are thought to occur due to various biophysical, psychological, social, genetic, and other comorbid factors that influence each other in the occurrence of LBP.[4,14–16]

Higher BMI is thought to be related to the occurrence of LBP by means of additional mechanical load to be supported by the spine, activation of proinflammatory pathways that cause systemic inflammation, degeneration of the intervertebral discs and vertebral endplate structures, and the emergence of comorbidities that affect perfusion to the spinal structures.[17,18] Higher BMI can also have a psychological effect on increasing the risk of LBP by forming a bad self-perception, especially in women.[6,19,20]

In this study, a significant association was found between the occurrence of LBP and gender (P = <0.001) and smoking habits (P = 0.022). The study by Alnojeidi et al. does not only found similar results, but also found that the prevalence of LBP was significantly higher in women than men.[21] Women have shown to have a lower threshold for pain perception and are more likely to report LBP to health professionals. Other psychological factors, hormonal changes and menstruation disturbances might also play a role in higher LBP occurrences in women.[12,15]

A significant relationship between smoking habit and LBP was also found in the study by Green et al. The nicotine in

cigarettes might trigger systemic inflammation and overstimulate the central nervous system which can lead to amplification and changes in the threshold for perception of pain.[22] Smoking can also trigger vasoconstriction which causes decreased perfusion and malnutrition in spinal structures.[23]

In this study, a significant relationship was not found between the occurrence of LBP and the level of physical activity (P = 0.909) and duration of sitting (P = 0.303). A study by Sitthipornvorakul et al. found no clear relationship between the level of physical activity and LBP.[24] The relationship between the two variables was depicted to form a U-curve where recurrent LBP tends to occur in the low physical activity level group and chronic LBP in the group with high physical activity level.[25,26]

Study by Lis et al. found that sitting duration can significantly increase the risk of developing LBP when accompanied by exposure to whole body vibration.[16] Prolonged sitting duration is thought to increase pressure and inhibit nutrient supply to the intervertebral discs, as well as reduce joint mobility and muscle strength in the lumbar area.[27,28]

Conclusion

In this study, no significant relationship was found between BMI and LBP in pre-clinical students of the Faculty of Medicine in Pelita Harapan University during the COVID-19 pandemic (P=0.420). However, a significant relationship was found between LBP and gender (P=<0.001); and smoking habits (P=0.022).

It is suggested for future research to increase the number of samples and expand the range of sampling and to directly measure BMI of the respondents. An increase in BMI and the occurrence of LBP are health problems that are multi-factorial, therefore living a healthy lifestyle is suggested to prevent these conditions in the future.

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