A Study from a Country with High Number Population: Risk Factors Associated with Low Back Pain among Middle-Aged Adults

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Abstract

BACKGROUND: Low back pain is a global health problem that affects the productivity of the patients. Several factors such as individual, occupational, and psychosocial factors increase the risk of low back pain. However, only a few studies investigated those factors, especially in middle adulthood in Indonesia.

AIM: This study was conducted to find out the factors associated with low back pain in middle adulthood.

METHODS: This study is a cross sectional- observational analytic study using a convenience sampling method with a total sample of 3005 respondents. Data were collected using a questionnaire which was then analyzed using the Chi-square test, Kolmogorov Smirnov, Spearman's Rank, and logistic regression test.

RESULTS: From the result of this study, it was found that the 12-month prevalence of low back pain in middle-aged adults was 44,29%. Female (p-value=0,002; OR=1,3; 95% CI=1,098–1,545), lack of physical exercises (p-value= 0,005; OR=0,87; 95% CI=0,794–0,959), high body mass index (p-value=0,002; OR=1,09; 95% CI= 1,009–1,187), stress level (p-value=0,002; OR=1,26; 95% CI=1,088–1,458), and working time (p-value=0,047; OR=1,1; 95% CI= 1,001–1,225) were determined as risk factors that significantly associated with low back pain.

CONCLUSION: Middle-aged adults in Indonesia have a quite high prevalence of LBP. The possible risk factors associated with LBP among middle-aged adults were female gender, higher body mass index, lack of physical exercise, stress level and working time. Middle-aged adults in Indonesia should be aware of LBP by identifying risk factors that might potentially worsen LBP in the future and avoid disabilities.

Introduction

Low back pain (LBP) is the most common musculoskeletal complaints and the most frequent causes of life with disabilities. The prevalence is ranged from 20–33% in all patients with musculoskeletal pain complaints worldwide. Low back pain is a complaint that is not only experienced by elderly people but also be found in all age categories including productive adults.⁽¹⁾ A study in the United States shows that low back pain occurs in one to three adults under the age of 65 each year, which indicates that middle adults (30–60 years) are likely to develop low back pain.⁽²⁾ Middle adulthood, referred to as the transitional period, is a period that is marked by changes both physically and psychologically. A study shows that the peak of productivity is performed by middle adults aged 40–45 years.^(3, 4)

There are many risk factors that affect the prevalence of LBP in middle adulthood. These factors are namely divided into three categories; individual, occupational, and psychosocial factors. Age, gender, body mass indeks (BMI), family history of illness, smoking habits, alcohol consumption, being married, female, and lack of routine exercises are categorized as individual risk factors.⁽⁵⁾ Whereas, occupational risk factors, for examples 11–80 % of these factors are involved in ergonomic factors such as sitting over,

lifting weights, and bending over.⁽⁶⁾ The population with the highest prevalence of LBP in small city in West Jawa, Jatinangor is the productive age (18–65 years). This is possibly due to the high physical and occupational loads that demanding a certain body position during work for prolonged period of time.⁽⁷⁾

Although various studies have examined the incidence, prevalence, and risk factors for LBP in middle adulthood, only a few research has studied regarding the prevalence and risk factors of LBP especially among middle-aged adults in Indonesia, a country with the fourth rank of the number of population with the productive aged people is in the highest proportion of population (15–64 year, 70.72%)⁽⁸⁾. In addition, low back pain could cause economic losses and decreased productivity of the patients.^(9, 10) Therefore, it is important to identify both modifiable and non-modifiable risk factors to prevent LBP. Based on the reasons mentioned above, this study was conducted to determine factors associated with low back pain among middle-aged adults in Indonesia.

Material And Methods

a. Study design and participants

A total of 3005 Indonesian middle aged adults were included of whom 1681 were male and 1324 were female. All participants gave consent and approval before filling ed the questionnaires in google forms. Data were collected from February 4–March 27, 2021. The sociodemographic and occupational related questions, low back pain questions and perceived stress scale questionnaire were included.

This study was approved by Clinical Study Ethics Commitee of Pembangunan Nasional Veteran Jakarta University (57/I/2021/KEPK). The respondents had given the **approval by informed consent to participate in this research. All methods were carried out in accordance with the Declaration of Helsinki."**

b. Outcome Measures

Assessment of Low Back Pain

Participants' low back pain events within the last 12 months were evaluated using low back part of Indonesian version of Standardized Nordic Musculoskeletal Questionnaire which was translated by Chairani (2013). Reliability score of this questionnaire was tested by Wicaksono (2019) with a result of cronbach's alpha score of 0.945. Therefore, all items in this questionnaire is valid and reliable.⁽¹¹⁾

Assessment of psychosocial risk factors

Stress levels of participants were evaluated through Perceived Stress Scale (PSS-10). Perceived Stress Scale is a 10-item questionnaire which uses likert scale where "0=none and 4=very often" consisting 6 positive items and 4 negative items (number 4,5,7 and 8).

Reliability test of Indonesian version of PSS-10 was studied by Pin (2011) with a result of cronbach's alpha score of 0,96.⁽¹²⁾ Our study also tested the validity and reliability of Indonesian's version of PSS-10

which showed all items in this questionnaire is valid and reliable (Cronbach's alpha score = 0,775). Total score of 0 – 13 demonstrates mild stress; 14 – 26 shows moderate stress and 27 – 40 shows severe stress.

c. Statistical analysis

Our research used SPSS 22 for all analyses. Univariate analyses are reported as numbers and percentages. Independent variables were analyzed using Chi-square test, Kolmogorov-smirnov test. Statistical significance was set at $p < 0.05$. Logistic regression method was used in this study as the multivariate analysis to determine the risk factors of low back pain.

Results

A total of 3005 middle-aged adults participated in this study, 35.4% of respondents aged 50–60 years. 55.9% of them were male. Respondents with bachelor/master/doctoral degrees were 66.4%. Respondents who were married were 89.7%. Most occupations were private employee (29.5%). The majority (74.7%) of respondents did not smoke. The 39.7% respondents rarely did physical exercises, however 47.3% of respondents had a normal BMI.

Based on calculations using a stress scale, the majority of respondents with a percentage of 57.3% had moderate stress level with total stress scale value of 14–26. The 83.3% of respondents did not have a chronic disease. The majority of respondents had an income of Rp. 5.000.000–Rp. 10.000.000 (27.3%). The majority of respondents with a percentage of 68.2% worked for > 10 years. Of 51.5% respondents spent working time per day for > 8 hours with the majority of sitting time $\leq$ 4 hours per day (59.5%) and tanding > 4 hours per day while working (65.9%) (Table 1).

Table 1
Demographic characteristics

No	Characteristics	n	%
1.	Age		
	30–39 years old	942	31.3
	40–49 years old	999	33.2
	50–60 years old	1064	35.4
2.	Gender		
	Male	1681	55.9
	Female	1324	44.1
3.	Level of Education		
	No formal education	23	0.8
	Elementary School	50	1.7
	Junior High School	79	2.6
	Senior High School	857	28.5
	Bachelor/Masters/Doctoral	1996	66.4
4.	Marital Status		
	Married	2696	89.7
	Divorced	89	3
	Never Married	220	7.3
5.	Occupation		

No	Characteristics	n	%
	Lecturer	179	6
	Physician	28	0.9
	Military/Police	373	12.4
	Government employees	346	11.5
	State Civil Apparatus	100	3.3
	Lawyer	10	0.3
	Accountant	6	0.2
	Consultant	7	0.2
	Labor	81	2.7
	Entrepreneur	163	5.4
	Housewife	405	13.5
	Private employees	887	29.5
	BUMN employees	38	1.3
	Nurse	37	1.2
	Farmer	71	2.4
	Driver	19	0.6
	Other	165	5.5
	Retired	61	2
	Unemployed	29	1
6.	Smoking Habit		
	Non-consumer	2244	74.7
	Consumer	761	25.3
7.	Physical exercise		
	<i>Grade 1 (Never)</i>	954	31.7
	<i>Grade 2 (Rarely)</i>	1193	39.7
	<i>Grade 3 (Regularly)</i>	858	28.6
8.	Body Mass Indeks (BMI)		

No	Characteristics	n	%
	Severe thinness	11	0.4
	Mild thinness	25	0.8
	Normal	1422	47.3
	Overweight	599	19.6
	Obesity	959	31.9
9.	Stress Scale		
	Mild (Score 0–13)	1250	41.6
	Moderate (Score 14–26)	1722	57.3
	Severe (Score 27–40)	33	1.1
10.	Chronic disease		
	Yes	503	16.7
	No	2502	83.3
11.	Monthly Income		
	< Rp 1.000.000	204	6.8
	Rp 1.000.000 – Rp 3.000.000	461	15.3
	Rp 3.000.000 – Rp 5.000.000	770	25.6
	Rp 5.000.000 – Rp 10.000.000	821	27.3
	> Rp 10.000.000	749	24.9
12.	Working time		
	< 5 years	541	18
	5–10 years	416	13.8
	> 10 years	2048	68.2
13.	Daily working hours		
	≤ 8 hours/day	1470	48.9
	> 8 hours/day	1535	51.1
14.	Sitting on working hours (daily)		
	> 4 hours	1218	40.5
	≤ 4 hours	1787	59.5

No	Characteristics	n	%
15.	Standing on working hours (daily)		
	> 4 hours	1979	65.9
	≤ 4 hours	1026	34.1

Based on univariate analysis, factors such as gender (p-value = 0,001), level of education (p value = 0,012), physical exercises (p-value = 0,002), BMI (p-value = 0,006), stress scale (p-value = 0,003), and working time (p-value = 0,002) associated significantly with low back pain (Table 2).

Table 2. LBP Prevalence in the last 12 months

No	Variable	LBP History				<i>p value</i>	Correlation Coefficient
		No		Yes			
		(n = 1674)		(n = 1331)			
		n	%	n	%		
1	Gender					0.001	0.061
	Male	982	58.4	699	41.6		
	Female	692	52.3	632	47.7		
2	Age					0.213	-0.003
	30 – 39 years old	534	56.7	408	43.3		
	40 – 49 years old	534	53.5	465	46.5		
	50 – 60 years old	606	57	458	43		
3	Level of Education					0.012	0.021
	No formal education	8	34.8	15	65.2		
	Elementary	27	54	23	46		
	Junior High School	49	62	30	38		
	Senior High School	511	59.6	346	40.4		
	Bachelor/Masters/Doctoral	1079	54.1	917	45.9		
4.	Marital Status					0.397	0.018
	Married	1494	55.4	1202	44.6		
	Divorced	48	53.9	41	46.1		
	Never Married	132	60	88	40		
5.	Occupations					0.309	0.004
	Lecturer	89	49.7	90	50.3		
	Physician	14	50	14	50		
	Military/Police	253	67.8	120	32.2		
	Government employees	169	48.8	177	51.2		
	State Civil Apparatus	53	53	47	47		

Lawyer	4	40	6	60
Accountant	4	66.7	2	33.3
Consultant	4	57.1	3	42.9
Labor	48	59.3	33	40.7
Entrepreneur	73	44.8	90	55.2
Housewife	232	57.3	173	42.7
Private employees	511	57.6	376	42.4
BUMN employees	17	44.7	21	55.3
Nurse	14	37.8	23	62.2
Farmer	40	56.3	31	43.7
Driver	10	52.6	9	47.4
Other	85	51.5	80	48.5
Retired	37	60.7	24	39.3
Unemployed	17	58.6	12	41.4

6.	Smoking Habit					0.175	-0.025
	Non consumer	1234	55	1010	45		
	Consumer	440	57.8	321	42.2		
7.	Physical Exercise					0.002	-0.062
	<i>Grade 1</i> (Never)	489	51.3	465	48.7		
	<i>Grade 2</i> (Rarely)	678	56.8	515	43.2		
	<i>Grade 3</i> (Regularly)	507	59.1	351	40.9		
8.	Body Mass Index (BMI)					0.006	0.041
	Severe thinness	2	18.2	1	81.8		
	Mild thinness	14	56	11	44		
	Normal	827	58.2	595	41.8		
	Overweight	330	56.1	258	43.9		
	Obesity	501	52.2	458	47.8		
9.	Stress Scale					0.003	0.059
	Mild (Score 0 – 13)	736	58.9	514	41.1		
	Moderate (Score 14 – 26)	925	53.7	797	46.3		
	Severe (Score 27 – 40)	13	39.4	20	60.6		
10.	Working time					0.002	0.02
	< 5 years	327	60.4	43	39.6		
	5 – 10 years	204	49	22	51		
	> 10 years	1143	55.8	97	44.2		
11.	Daily working hours					0.82	0.004
	≤ 8 hours/day	822	55.9	648	44.1		
	> 8 hours/day	852	55.5	683	44.5		
12.	Sitting on working hours (daily)					0.433	0.014
	> 4 hours	985	55.1	802	44.9		
	≤ 4 hours	689	56.6	529	43.4		
13.	Standing on working hours (daily)					0.85	-0.003
	> 4 hours	574	55.9	452	44.1		

As for multivariate analysis, factors that significantly associated with low back pain were female gender (p-value = 0,002; OR = 1,302; 95% CI = 1,098–1,545), lack of physical exercises (p-value = 0,005; OR = 0,872; 95% CI = 0,794–0,959), higher BMI (p-value = 0,30; OR = 1,094; 95% CI = 1,009–1,187), stress level (p-value = 0,002; OR = 1,259; 95% CI = 1,088–1,458), and working time (p-value = 0,047; OR = 1,108; 95% CI = 1,001–1,225) (Table 3).

Table 3. Logistic Regression of Risk Factors Associated with Low Back Pain

Variables	OR (Exp B)	95% CI	<i>p value</i>
Individual Risk Factors			
Gender	1.3	1.098 – 1.545	0.002*
Age	0.98	0.891 – 1.077	0.669
Level of Education	1.08	0.971 – 1.203	0.155
Body Mass Index	1.09	1.009 – 1.187	0.002*
Smoking Habit	1.02	0.838 – 1.231	0.872
Physical Exercise	0.87	0.794 – 0.959	0.005*
Occupational Risk Factors			
Working time	1.1	1.001 – 1.225	0.047*
Psychosocial Risk Factors			
Stress Level	1.26	1.088 – 1.458	0.002*

OR: Odds Ratio; CI: Confidence Interval; *p<0.05

Discussions

Low back pain affect productive people and influence an individual's work capacity and overall well-being.⁽¹³⁾ The prevalence of low back pain is very high and is a major cause of living with disabilities.⁽¹⁴⁾ There are several factors that determine the incidence of LBP such as sociodemographic, ergonomic, and psychosocial factors.⁽¹⁵⁾

LBP prevalence in Indonesian middle age adult

Our findings showed that the prevalence of LBP in middle-aged adult Indonesian measured at 12 months was 44.29%. This findings were in line with previous systematic study that LBP is occurred most in

persons age 40–80 years and prevalence $23.2 \pm 2.9\%$.⁽¹⁾

The prevalence of LBP varies from country to country.⁽⁷⁾ Another systematic cohort studies show the prevalence of LBP in the general population is 15–45%.⁽¹⁶⁾ The prevalence of LBP in the general population in Saudi Arabia is 18.8%.⁽¹⁷⁾ A study about prevalence of LBP in Japan shows a one-month prevalence of 35.7% and lifetime prevalence of 83.4%.⁽¹⁸⁾

Risk factors of LBP in middle age adult

Our study demonstrates gender was associated with LBP. In agreement to other studies, we found that the prevalence of LBP was higher in females than in males.^(5, 7, 19, 20) Females tend to have a lower pain threshold than men, therefore they often report the symptoms of LBP than men.^(21, 22) Other studies have reported that that females tend to have a higher risk of LBP because of hormone imbalances. During pregnancy, the hormonal imbalances loose the spinal ligaments that decrease the strength of the lower back muscles and increase the risk of LBP.^(6, 23, 24) Fernandez et al suggested that menopausal osteoporosis caused LBP in women⁽²⁵⁾ and another study concluded obesity is associated with LBP in women.⁽²⁶⁾ Another reason of females having more LBP was loads of housework⁽⁷⁾, menstruation^(27–29).

In agreement with earlier findings,^(5, 30) our findings suggested that BMI was one of significant risk factors of low back pain. Simsek et al, reported that low back pain was 0.9 times more prevalent in people with higher body mass indeks.⁽⁵⁾ A study among healthcare workers also suggested that high BMI was associated with LBP.^(31, 32) Possible explanations include (1) Increasing mechanical compression in the lumbar spine during movements in obese people possibly enhances mechanical burden (2) The likelihood of having of an accident thus possibly increasing the risk of LBP.(3) Adipose tissues produce produces some proinflammatory cytokines (e.g., tumor necrosis factor- α , interleukin-6) that trigger the release of C-reactive protein (CRP), and this statement was supported by the fact that females with normal waist circumference and high CRP have tendency to report LBP than females with low CRP.^(26, 32)

Consistent with other researchs, we observed LPB is more prevalent in people who rarely or never did exercises.^(5, 6, 21, 32, 33) LBP occurs due to of shortened and weaken back muscles, therefore causes misalignment of the spine. Exercise decreases the event of LBP due to (1) lengthen the back muscles to support and keep the spine in proper alignment. Regular exercise increases blood supply to the spine muscles, joints, and intravertebral discs to minimize injury and increasing repairment.^(6, 21). (2) Exercise reduces stress and the level of cortisol which increases in stress conditions.^(34–36) Other studies have reported that strengthening the spinal muscles by exercises such as stretching or aerobic training decreases LBP by 30% in terms of intensity of pain and disability.⁽²⁶⁾

The result of this study suggested that the severity of stress had a significant correlation with low back pain. This study was in line with a study from Korea that confirmed severe stress was correlated with a 2.8-fold increase in risk of chronic low back pain compared to the general population.⁽³⁷⁾ Stress triggers the secretion of cortisol in the bloodstream. Cortisol is a potent anti-inflammatory hormone, and repeated

peaked cortisol stimulates cortisol defect. Consequently, this lead to oxidative stress, release free radicals, cellular injury, which lead to chronic pain.⁽³⁸⁾ Higher cortisol levels are associated with a lower strength of lumbar muscles, resulted in LBP.^(6, 34)

Our study results confirmed that working time was significantly associated with LBP. This fact correlates with a study that focused on nurse, that 5 years of experiences nurses were 3 times more likely to experience LBP. ^(39–41) The explanation for this fact is, that nurses are more likely to expose to physical and psychological hazards during his/her entire works. ⁽⁴⁰⁾

The limitation of this study was (1) the sampling method which did not use probability (random) sampling due to the COVID-19 pandemic, so the results might be biased. However, we present a local survei with quite huge number of pupulation. (2) The data of height and body weight might be not original presented because due to pandemic that hinders direct contacts, measurements of height and body weight were not possible.

Conclusions

Middle-aged adults in Indonesia has a quite high prevalence of LBP. The possible risk factors associated with LBP are female, high body mass index, lack of physical exercise, stress level and working time. Middle-aged adults in Indonesia should be aware of LBP by identifying individual, occupational and psychosocial risk factors that might potentially worsen LBP in the future and to avoid disabilities caused by low back pain.

Abbreviations

BMI
body mass indeks
LBP
low back pain

Declarations

Ethics approval and consent to participate

This study was approved by Clinical Study Ethics Commitee of Pembangunan Nasional Veteran Jakarta University (57/I/2021/KEPK). The respondents had given the approval of consent to participate in this research.

Consent for publication

Not applicable

Availability of data and material

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests

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We declared no funding related with our study.

Authors' contributions

TA, NK, worked on collecting data, preparing figures, and manuscript writing. FM reviewed the manuscript. FM is a fully experience neurosurgeon in Jakarta, Indonesia.

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