

Original Research

**Individual Factors Influence Incidence Of Low Back Pain In Batik Craftsman**

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**ABSTRACT**

**Background:** The incidence of low back pain in Indonesia is still relatively high with an injury prevalence of 6.5%. One of the contributor of the high incidence rate is caused by occupational factors such as works that are repetitive in nature, that imposes forced power, and static work. One of the job that poses this risk is batik craftsmen. It is estimated that there are 15.000 batik craftsmen who are actively working in Central Java Province. The aim of study was to determine association between individual factors and incidence of low back pain in batik craftsman.

**Methods:** This study is a quantitative study with cross-sectional design, conducted in February 2021 in Central Sokaraja Village. Sample collection was carried out with total sampling method with a total sample of 60 respondents. Data analysis technique used in this study was Chi square test

**Results:** The result of Chi square test showed that there is a significant association between work period and low back pain ( $p=0.001$ ), there is a significant association between sitting duration and low back pain ( $p=0.028$ ), there is a significant association between work load and low back pain ( $p=0.002$ ), there is no significant association between gender and low back pain ( $p=0.081$ ), there is no significant association between age and low back pain ( $p=0.632$ ), and there is no significant association between body mass index and low back pain ( $p=0.807$ ). From multivariate analysis, it was found that there is a significant association between work period and low back pain ( $p=0.026$ ).

**Conclusion:** There is a significant association between work period, sitting duration, and work load with low back pain, while there is no significant association between age, gender and body mass index (BMI) with low back pain.

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**INTRODUCTION**

Pain in the lower back or commonly known as LBP (Low Back Pain) is a local or radicular pain in the lower back (Manchikanti *et al.*, 2014). There are three precipitating factors, which are individual factor, environmental factor, and occupational factor.

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Individual factor is related to age, gender, working time, work period, position while working, obesity or overweight, and several other bad habits of workers such as smoking, rarely exercise, alcohol consumption, etc. Environmental factors including prolonged exposure to vibration or extreme temperature which can be a precipitating factor of LBP. The last precipitating factor is occupational factor such as works that are repetitive in nature, works that imposes forced power, and static work (Gaya, 2015).

Based on the research stated that in the Kindergarten Hospital. III R.W Monginsidi Manado mostly, namely, nurses aged 24-32 years as many as 87.5%. According to the theory when the age after 30 years, the intervertebral disc degenerates, there can be tearing and scar tissue, fluid becomes less, the disc cavity becomes permanently shallow and the stability of the spinal segment is lost. When the nucleus fluid decreases, the ability decreases and the pressure becomes restrained when compressive motion occurs, it can be said that age is one of the factors of LBP (Sumangando et al., 2017).

Batik craftsmen have a risk of developing LBP because they work in a sitting position for long hours, approximately 4-6 hours to work on the writing of batik cloth (Umami, 2014). The lack of attention of the workers regarding the ergonomic of their sitting position including sitting posture, height of the tables and chairs, and resting periods during work hours, contributed to the high incidence rate of LBP which is closely related to occupational factor (Chen *et al.*, 2017). This is indicated by the results of a survey conducted by COPCORD or Community Oriented Program for Control of Rheumatic Disease in 2014 which showed that the incidence of LBP in Indonesia was 13.6% in female and 18.2% in male (Kusuma & Hartanti, 2014). According to Riskesdas 2018, the prevalence of back injury was 6.5% (Kementerian Kesehatan RI, 2018).

Based on research (Mulfianda et al., 2021) there is a relationship between sex and the incidence of LBP in employees, that respondents with female sex experience more LBP than male respondents, this incident can be caused because the physiological abilities of female muscles are lower than male muscles, because women experience menstruation and menopause so that bone density decreases, a decrease in the hormone estrogen may cause low back pain, so LBP tends to occur more in women than men. A long working period can cause a high risk of LBP because doing work repeatedly in a period of years of course the body will be disturbed. However, on the other hand, workers with new tenures tend to have a low risk of LBP. Because there is an increase in demand for PT Surya Besindo Sakti products from consumers, workers have to work longer to complete the work. So, it can be a risk for LBP complaints.

LBP incidents can occur because work is done every day and repetitive work attitudes result in LBP complaints. In this study, it is in line with previous research, when the work prioritizes physical weight, it will affect the muscles, if it lasts a long time without sufficient rest, it causes the body's ability to decrease and the limbs will become sick (Sakti, 2017). According to research (Mulfianda et al., 2021) with results that are inversely proportional to previous research stating that there is a relationship between BMI and LBP in employees, respondents with BMI over weight experience a lot of LBP compared to respondents with BMI normal weight, because BMI over weight triggers the spine being pressure is at risk of experiencing LBP and someone who is overweight has a big risk, namely, 5 times LBP occurs than someone with an ideal body weight.

According to a study by (Darajat, 2019) in his study on Batik craftsmen in Giriloyo Batik Village found that there was a significant association between work period and low back pain complaint. The hand-drawn batik workers in the Pelawangan sub-district do it by sitting down. Work activities on batik by sitting statically for a long period of time >2 hours cause the back to bend because the muscles of the body experience fatigue, ideally sitting in terms of anatomy, namely the state of the back is straight and straight, therefore it is the cause of bending for too long causing LBP complaints(Harahap et al., 2019).

When working in a day 8-10 hours as a person's maximum ability if it exceeds that time the quality of work efficiency greatly decreases(Sari et al., 2015). According to Rachmat (2019) in his study also found that prolonged sitting duration (>4 hours) affect the incidence of LBP. These factors are important to be studied further because according to the data from Department of Industry and Commerce of Central Java Province, it is estimated that there are 15.000 batik craftsmen who are actively working in the Central Java Province (Disperindag Jawa Tengah, 2017).

Based on the theory of the causes of workload, one of which is excessive workload quantitatively nurses must conduct strict patient observation during working hours, there are many and too diverse jobs to be done, as well as direct contact between nurses and patients continuously during working hours, and the ratio of nurses to patients. patients (Sumangando et al., 2017). According to other studies, when the workload is heavy, the LBP is also experienced by a person (Yacob et al., 2018).

Several individual factors showed a positive correlation with the incidence of LBP. There has not been any study regarding the individual factors of age, gender, body mass index, work period, sitting duration, and work load and the incidence of LBP in batik craftsmen, therefore, aim of study is the association between these factors and the incidence of LBP in batik craftsmen in Sokaraja District, Banyumas Regency.

## **MATERIALS AND METHOD**

This study has an eligibility permit from ethical clearance Number: KEPKK/FK/005/I/2021 from the Head of the Health and Research Ethics Committee, Faculty of Medicine Muhammadiyah University Purwokerto. This is a quantitative study with cross-sectional design. This study was conducted in Central Sokaraja Village, Sokaraja District, Banyumas Regency. The study was carried out in February 2021.

The study sample were all batik craftsmen in Central Sokaraja Village, Sokaraja District, Banyumas Regency. In this study, respondents were chosen based on inclusion and exclusion criteria. The inclusion criteria were: (1) age 25-65 years old, (2) consented to be a study subject. While the exclusion criteria were: (1) women who are in menstrual period, (2) pregnant women, (3) have a history of spinal injury/disorder (such as: osteoporosis, kyphosis, scoliosis, lordosis, and herniated nucleus pulposus), (4) did not attend during the study or data collection.

Data analysis includes: (1) Univariate analysis using Kolmogorov Smirnov test to determine the characteristics and distribution of study respondents, (2) Bivariate analysis using Chi square test to determine whether there is an association between the variables of age, gender, work period, body mass index, sitting duration, and work load with low back pain, (3) Multivariate analysis using Binominal Logistic Regression to determine the strength of the association between the variables of age, gender, work period, body mass index, sitting duration, and work load with low back pain. The total

sample of the study were 60 respondents with total sampling technique. The independent variables of this study was measured with ordinal scale, gender was with nominal scale, body mass index was with ordinal scale, work period with nominal scale, sitting duration with nominal scale, and work load was with ordinal scale. The dependent variable of low back pain was measured using nominal scale.

## RESULTS

Results of the study are presented on the table below:

**Table 1.** Univariate Analysis (Study Respondents Characteristics)

Variables	Frequency (n)	Percentage (%)	OR	95% C.I for OR	
				Lower	Upper
<b>Age</b>					
Moderate-Risk	2	3,3	0,000	0.000	0.000
High-Risk	58	96,7			
<b>Gender</b>					
Male	7	11,7	3.525	0.298	41.630
Female	53	88,3			
<b>Work Period</b>					
Not Long ( $\leq$ 4 years)	10	16,7	10.891	1.163	101.995
Long ( $>$ 4 years)	50	83,3			
<b>BMI</b>					
Underweight ( $<$ 18.5)	2	3,3			
Normal (18.5-22.9)	11	18,3			
At risk (23-24.9)	10	16,7			
Obese I (25-29.9)	28	46,7	0.994	0.770	1.283
Obese II ( $>$ 30)	9	15,0			
<b>Sitting Duration</b>					
Not long ( $\leq$ 4 hours)	17	71,1	1.477	0.128	17.093
Long ( $>$ 4 hours)	43	28,3			
<b>Work Load</b>					
Light (5-9)	15	25			
Moderate (10-13)	28	46,7	0.725	0.481	1.094
Heavy (14-17)	17	28,3			

According to the table above, the most prevalent age characteristic of the respondents was from the high-risk category which were 58 respondents (96.7%). The most prevalent gender characteristic of the respondents was from the female category which were 53 respondents (88.3%). The work period characteristic of the respondents was most prevalent from the long category ( $>$  4 years) which were 50 respondents (83.3%). The BMI characteristics of the respondents was most prevalent from the obese I category which were 28 respondents (46.7%).

The most prevalent sitting duration characteristic of the respondents was from the long sitting duration ( $>$ 4 hours) per day which were 43 respondents (71.7%). The work load characteristic of the respondents was most prevalent from the moderate work load which were 28 respondents (46.7%). The low back pain characteristic of the

respondents was most prevalent from the low back pain category which were 54 respondents (90.0%).

**Table 2.** Bivariate Analysis

Variables	Category				P Value
	Low Back Pain		No Low Back Pain		
	N	%	N	%	
<b>Age</b>					
Moderate Risk	2	3,3	0	0	0,632
High Risk	52	86,7	6	10	
<b>Gender</b>					
Female	49	81,7	4	6,7	0,081
Male	5	8,3	2	3,3	
<b>Work Period</b>					
Long (>4 years)	48	80	2	3,3	0,001
Not long (≤4 years)	6	10	4	6,7	
<b>BMI</b>					
Underweight (<18,5)	2	3,3	0	0	0,807
Normal (18,5-22,9)	10	16,7	1	1,7	
At risk (23-24.9)	8	13,3	2	3,3	
Obese I (25-29.9)	26	43,3	2	3,3	
Obese II (>30)	8	13,3	1	1,6	
<b>Sitting Duration</b>					
Long (>4 hours)	41	68,3	2	3,3	0,028
Not long (≤4 hours)	13	21,7	4	6,7	
<b>Work Load</b>					
Light (5-9)	10	16,7	5	8,3	0,002
Moderate (10-13)	27	45	1	1,7	
Heavy (14-17)	17	28,3	0	0	

According to table 2, the work period variable has a p value of 0.001 which was < 0.05 meaning that there is a significant association between work period and low back pain. The sitting duration variable has a p value of 0.028 which was < 0.05 meaning that there is a significant association between sitting duration and low back pain. The work load variable has a p value of 0.002 which was < 0.05 meaning that there is a significant association between sitting duration and low back pain.

**Table 3.** Multivariate Analysis

Study Variables	P value	OR	95% C.I. for OR	
			Lower	Upper
Work period	0,026	11,479	1,347	97,808
Sitting Duration	0,638	1,782	0,161	19,726
Work Load	0,135	0,735	0,491	1,100
Negelkerke R Square	0,430			
Chi Square	0,053			

According to Table 3. Binomial logistic regression analysis, the work period variable has a p value of 0.026 which was  $<0.05$  meaning that work period has a significant association with low back pain in batik craftsmen.

## **DISCUSSION**

According to the results of the study analysis, it was found that the work period variable has a p value of 0.001 which was  $<0.05$ , therefore, work period and low back pain has a significant association. The result of this study is supported by previous study conducted by Riningrum (2016) that there is an association between work period and low back pain complaint with a p value of 0.02 which is  $<0.05$ . Work period is a variable that is a contributing factor for musculoskeletal disorders. The longer the work period, the movements tend to be relatively similar and repetitive.

This in turn became a precipitating factor for tissue fatigue, which then cause overuse of the muscle tissue which can cause muscle stiffness (spasm). This develop as a form of self-defense as a physiological effect of the muscles to prevent and reduce the risk of severe damage to tissues, and also as a natural body response to channel information to stop the on-going activities and immediately rest to maintain the body condition properly. Moreover, the longer work period cause the disc space to develop constant narrowing and cause spinal degeneration which will cause LBP (Suryadi, 2020).

The sitting duration variable is significantly associated with low back pain, which is indicated by the p value of 0.028 which is  $<0.05$ . This is in accordance with the study by, Pratiwi (2020) which stated that the lower back muscles are stretched due to the constant sitting position that lasted for  $>4$  hours. When the muscles are stretched, inflammation that causes spasm develops. The tissue that develop injury can be acute and chronic, which cause skeletal muscle spasm, hyperalgesia, vascular vasoconstriction and myofascial ischemia. Moreover, the intervertebral discs will undergo reduced blood supply as an effect of increased biomechanical stress and micro-trauma.

If the micro-trauma is repetitive, it will cause circumferential and radial tears of the annular fibers, endplate barrier, loss of nutrition and hydration of the nucleus. Both circumferential or radial tear extends the nucleus out from the annular membrane to the epidural space resulting in compression or disruption of the nerve roots. Mechanical stimulus can be an active peripheral nociceptor causing pain in the spinal segment particularly the lower back area, causing anaerobic metabolism and increased lactic acid. Chronic inflammation will stimulate substance P which function to produce algogens in the form of prostaglandin, bradykinin, and serotonin which can cause pain.

The association between work load and low back pain is significant, indicated by the p value of 0.002 which is  $<0.05$ . The work load endured by a person can cause fatigue, therefore, a high work load will have an impact on how quickly someone gets fatigued. A constant prolonged muscle load can cause muscle ache and other disturbances. Fatigue caused by work environment with constant muscle strain and reduced blood flow. This will in turn cause build-up of lactic acid (Budiman *et al.*, 2016).

If the work load gets higher or the work period gets longer, it will cause work fatigue. Excessive work load can result in muscle fatigue which early signs of symptoms is muscle ache or pain in the muscles. The following means can reduce and relieve fatigue with several different approaches, including managing work period and work environment (Awaluddin *et al.*, 2019).

According to the result of the study, the p value for age variable was 0.632 which is  $>0.05$ , meaning there is no significant association with low back pain. This result is supported by the study by Nelwan (2014) that there is no association between age and low back pain complaint with a p value of 0.060 which is  $>0.05$ . This is probably due to the distribution of sample which were more prevalent from the age  $>25$  years old group than from the  $\leq 25$  years old group which was 74% compared to 26% (Arwinno, 2018).

According to Riningrum (2016), maximum muscle strength is achieved during the age of 20 – 49 years old, and at 60 years old the mean muscle strength will be reduced by 20%, other causes may include non-ergonomic postures which can cause LBP. The number of muscle fibers began to diminish at the age of 25 years old which cause reduced muscle strength. Even though the overall number of muscle fibers are reduced, if the mass is large, the muscle strength will be maintained. Even though the age of the workers were  $>35$  years old, it can also be affected by food intake and nutrition, adequate resting time, and body endurance.

Therefore, a large muscle mass can increase metabolism and energy production. If there is excessive energy production, muscle fatigue will rarely occur which in turn reduce the risk of LBP. There is also no significant association between the gender variable and low back pain (p value  $0.081 > 0.05$ ). LBP in female occur due to the level of muscle strength of a female physiologically is lower than male. Female only have approximately 60% of muscle strength compared to male, particularly in the back, arm, and legs muscles.

The LBP complaint in male are mostly related to the rough work, such as in construction workers and farm laborers. Moreover, the insignificant association between gender and incidence of LBP is also caused by the unequal data distribution. At productive age, male and female possess equal risk of LBP complaint (Maghfirani, 2019). According to the result of the study, the p value for BMI variable was 0.081 which is  $>0.05$ , meaning the BMI variable has no significant association with low back pain. Hadyan (2017) also stated that the higher the BMI, it can be estimated that the energy produced during work will be in parallel greater.

Someone with a bigger body posture, tend to be able to lift heavier items. However, in the case of heavy lifting is done with a correct position, so that there is no excessive muscle straining, and LBP do not occur. A heavier body weight is in parallel with larger muscle mass, but not followed by increased height, therefore the BMI will be high. In fact, if someone has a large muscle mass, generally also has strong back and waist muscles, therefore LBP complaint rarely occur (Septadina & Legiran, 2014).

The limitation of this study was that some respondents were illiterate, could not read and write, therefore the authors had to guide them in reading and filling the questionnaire. Moreover, some respondents had poor vision, therefore the authors had to guide and read the questions of the questionnaire so that the respondents can answer the questions. Along with the COVID-19 pandemic making it hard to get respondents to gather in one place due to the health restrictions for COVID-19, therefore respondents must be gathered in different shift which cause disturbance in their work time.

Further study regarding other risk factors combined by comorbidities or other factors is expected to support the result of the study on low back pain. Maintaining health and paying attention to the working position of the batik craftsmen in ergonomic sitting position can be suggested to the owner of batik production house.

## CONCLUSION

There is a significant association between work period, sitting duration, and work load with low back pain, but there is no significant association between age, gender, and BMI with low back pain. It is recommended for workers to pay more attention to position when working in order to avoid disease so that the sitting position remains in an ergonomic position.

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