

Research Article



The Influence of Work Posture and Work Duration on the Incidence of Low Back Pain Among Batik Artisans: a Cross-sectional Study

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ABSTRACT

Background: Batik artisans, particularly those involved in the "nyanting" process, are susceptible to lower back pain due to non-ergonomic working postures. These craftsmen sit for long durations as they meticulously apply wax to fabric. They utilize dingklik, which compels them to sit in a slightly hunched position. The repeated adoption of such postures can heighten the risk of lower back pain. This research aims to investigate the relationship between work posture, years of service, and the incidence of low back pain among "nyanting" batik artisans in Pulorejo Village

Methods: This observational analytical research employed a cross-sectional approach with 42 "nyanting" batik artisans chosen through a total sampling technique. Conducted in Pulorejo Village in January 2024, the research assessed work posture using the Rapid Entire Body Assessment (REBA) instrument, while the occurrence of low back pain was evaluated through history taking and physical examination. Statistical analysis was performed using IBM SPSS version 25.0 software.

Results: A significant positive correlation was found between years of service and the occurrence of low back pain (LBP) ($p=0.002$; $r=0.471$). The risk of LBP increases with the length of service. Additionally, there was a significant positive correlation between working posture, as indicated by the REBA score, and the occurrence of LBP ($p=0.010$; $r=0.395$). A higher REBA score corresponds to a greater risk of LBP.

Conclusions: the Years of service and the working posture were associated to the incidence of low back pain (LBP) among "nyanting" batik artisans in Pulorejo Village.

Keywords : low back pain, , rapid, whole body, assessment, working period

INTRODUCTION

Low back pain (LBP) is characterized by pain and discomfort localized below the costal border. Among other factors, poor ergonomics contribute to LBP. According to the *Global Burden of Diseases (GBD) 2020* report, there are five hundred million LBP cases worldwide, with an estimated increase of 36.4% by 2050.¹ The number of LBP patients in Indonesia is estimated in the range of 7.6% to 37% based on the 2018 Riskesdas data.²

Low back pain is a common issue among various workers, including batik craftsmen. The risk factors for these artisans include individual factors such as age, gender, exercise habits, and obesity, as well as occupational factors like work posture, length of service, exposure to continuous vibration, repetitive tasks, high energy requirements, and extreme temperatures.^{3,4} Bending work postures are often carried out by batik craftsmen, especially *nyanting* craftsmen. Work postures like this increase the risk of LBP by 2.6 - 8 times greater.⁵

Batik artisans in the *nyanting* section typically sit for extended periods to meticulously apply wax to the fabric.⁴ Typically, small chairs with short legs (*dingklik*) are used, causing the *nyanting* process to be performed in a slightly hunched position. Continuously maintaining poor working postures over an extended period can elevate the risk of LBP.⁶ When the posture is not ergonomic, muscles and tendons must work harder to keep the spine stable. Fatigued muscles will generate lactic

acid, which can activate nociceptors and cause pain.⁷

Numerous studies have indicated a strong correlation between work posture and *low back pain* complaints among batik workers. Research conducted in Semarang revealed a connection between work posture, length of service, and age with LBP complaints.⁸ A research using the *Nordic Body Map* as an indicator of *musculoskeletal disorders* also found a moderate relationship ($r=0.477$) with the work posture of batik *home industry* workers in Madura.⁹ A survey of 42 batik artisans in Pulorejo Village found that 30 artisans (71.5%) had at least one musculoskeletal complaint.

It has been reported that up to 50% of batik artisans suffer from musculoskeletal complaints. Identifying the risk factors for these issues is crucial, as it can guide authorities in implementing treatment or preventive measures to address similar complaints. The author intends to find out more about the topic of LBP complaints in batik workers.

METHOD

This research employs an analytical observational research design using a *cross-sectional approach*. The subjects consist of 42 batik craftsmen from Pulorejo Village who meet the research criteria. Inclusion criteria are: willing to participate, aged 18-80 years, having a BMI of 18-25 kg/m², and exclusively working at the *nyanting* stage in a single location. Exclusion criteria include a history of low back trauma, spinal disorders, or pregnancy.



Data collection includes demographic information such as age and gender, occupational data, history and physical examination data on LBP, and work posture data assessed using *Rapid Entire Body Assessment (REBA) scores*. The diagnosis of LBP is based on a history of low back pain complaints and LBP-specific physical examinations such as *Laseque*, *Bragard*, and *Sicard* examinations. The REBA score combines the A score (torso, neck, and legs) and the load score with the B score (upper arm, forearm, and wrist) and *coupling* score based on the REBA C score table. The

REBA C score is then added to the activity score to determine the final REBA score. This final score indicates the risk level of musculoskeletal complaints among workers: a score of 1 signifies negligible risk, 2-3 indicates low risk, 4-7 suggests moderate risk, 8-10 means high risk, and 11-15 denotes very high risk. Data on the length of service was collected via a questionnaire and categorized into short tenure (<5 years) and long tenure (≥5 years). Data were analysed using *IBM SPSS Statistics* version 25.0. This research has obtained ethical clearance.

RESULTS

Respondent Characteristics

The average age of the respondents was 40.4 years. The majority of batik artisans were female, comprising 36 individuals (85.7%). The mean BMI was 23.8 kg/m². Additionally, 36 artisans (85.7%) had been working for more than 5 years. The average REBA score was 8.1. According to the REBA scores, 17 craftsmen (40.5%) were at moderate risk, 22 (52.4%) were at high risk, and 3 (7.1%) were at very high risk. Furthermore, 24 individuals (57.1%) experienced *low back pain*. Detailed subject characteristics are presented in Table 1.

Table 1. Characteristics of Research Subjects

Variables	n (%)	Average
Age		40,4 ± 9,5
Gender		
Women	36 (85,7)	
Male	6 (14,3)	
Body Mass Index (kg/m)²		23,8 ± 3,9
Period of service		
<5 years	6 (14,3)	
>5 years	36 (85,7)	
REBA		8,1 ± 1,6
Medium risk (REBA 4-7)	17 (40,5)	
High risk (REBA 8 - 10)	22 (52,4)	
Very high risk (REBA 11 - 12)	3 (7,1)	
LBP		
Yes	24 (57,1)	
No	18 (42,9)	

The average age in the LBP group was 43.2 years, compared to a lower mean of 36.7 years in the non-LBP group. Among the LBP group, there were 21 female artisans (58.3%), while the non-LBP group had 15 female artisans (41.7%). The number of male artisans was equal in both groups. The body mass index of artisans with LBP was higher than that of those without LBP, at 24.2 versus 23.4 kg/m².

Table 2 Characteristics of Respondents based on *Low Back Pain* Complaints

Variables	LBP	
	Yes (%)	No (%)
Age		
18 - 39	7 (43,8)	9 (56,2)
40 - 60	17 (65,4)	9 (34,6)
Gender		
Women	21 (58,3)	15 (41,7)
Male	3 (50,0)	3 (50,0)
Body Mass Index	24,2 ± 4,1	23,4 ± 3,8

Relationship between Work Posture and Tenure and LBP

The Spearman correlation test analysis yielded a significance value (p-value) of 0.010 and an r-value of 0.395. These bivariate test results indicated a significant relationship between work postures and the incidence of LBP. The positive r-value suggests that as the REBA score increases, the risk of LBP also rises.

Table 3 Relationship between Work Posture and Working Period with the Incidence of LBP

Variables	LBP		P-value	Value-r
	Yes (%)	No (%)		
Work Posture				
Medium risk	6 (35,3)	11 (64,7)	0,010*	0,395
High risk	15 (68,2)	7 (31,8)		
Very high risk	3 (100)	0 (0,0)		
Period of Service				
<5 years	0 (0,0)	6 (100)	0,002*	0,471
>5 years	24 (66,7)	12 (33,3)		

*=p<0,05

Bivariate analysis examined the relationship between the working period and the incidence of LBP among canting craftsmen in Pulorejo Village. The Spearman correlation test analysis produced a p-value of 0.002 and an r-value of 0.471. These outcomes indicate a

significant relationship between the working period and the incidence of LBP. The positive r -value suggests that a longer work period correlates with an increased risk of LBP.

DISCUSSION

The average age in the LBP group was higher than in the non-LBP group, at 43.2 years compared to 36.7 years. This outcome aligns with the research by Silitonga and Utami (2021), which identified age as a risk factor for LBP complaints among workers. Their research suggests that being over 30 years old increases the risk of developing LBP.¹⁰ In line with this, research by Saputra, 2020 obtained similar results. There is a significant relationship between age and LBP complaints ($p=0.020$; $r=7.811$).⁸

Bone degeneration begins around the age of 30 and progresses with age. This process involves the breakdown and replacement of bone tissue, accompanied by a reduction in the body's fluid composition.¹¹ This leads to decreased stability in the bones and muscles, making them more susceptible to fatigue. Muscle fatigue can result in pain. Additionally, the degeneration process can cause low back pain symptoms due to the loss of bone tissue elasticity.¹²

The stability of the lower spine is maintained through muscle coordination and various functional units, including the vertebrae, which consist of two adjacent vertebrae, vertebral plates, and intervertebral discs.¹³ These structures are essential for maintaining spinal stability. As we age, mechanical instability in these functional spinal units (FSUs) tends to increase, which accelerates the degenerative process and often leads to back pain.¹⁴

More female artisans experienced LBP than male artisans (58.3% vs. 50%). The research by Wulan et al. (2020) also reported differences in the risk levels of LBP between

male and female artisans.⁴ The risk level of muscle problems may vary depending on gender.¹⁵ Male muscle capabilities are generally greater than those of females, with women's muscle strength being approximately two-thirds that of men. Additionally, men typically have higher muscle endurance compared to women.¹⁶

A bivariate analysis revealed a significant correlation between tenure and the occurrence of lower back pain (LBP) ($p=0.002$; $r=0.471$). These outcomes align with the research by Aulia et al. (2023). Batik artisans in Kauman Batik Village, Pekalongan City, who have been working for over five years, are more frequently affected by LBP complaints ($p<0.05$).¹⁷ These outcomes also corroborate earlier research by Harwanti (2018) on hand-written batik workers at the Sokaraja Batik home industry in Banyumas Regency. Harwanti's research identified a significant relationship between tenure and LBP complaints among batik workers ($p<0.001$), noting that most workers had been employed for over five years.¹⁸

Length of service is a crucial individual factor for workers. The longer someone is employed, the greater their risk of exposure. Muscle and bone fatigue from extended work periods also plays a role. Occupational disease risk factors depend on both dose and duration. Consequently, the longer the exposure time or employment period, the higher the exposure batik craftsmen experience.¹⁹ The duration of employment reflects the chronic accumulation of postural errors at work. Heavy physical labor impacts muscle performance. Prolonged work without

sufficient rest can reduce the body's ability to adapt, leading to limb pain.²⁰

The assessment of work posture using REBA reveals a correlation with the incidence of lower back pain (LBP) among batik craftsmen in Pulorejo Village. According to the Spearman correlation test, a p-value of 0.010 and an r-value of 0.395 were found, indicating a significant relationship between work posture and LBP incidence. The positive r-value suggests that as the REBA score increases, so does the risk of LBP. These outcomes are corroborated by Harahap et al. (2018), whose research on hand-written batik craftsmen in Jambi City also reported a significant relationship between work position and duration of service with LBP complaints ($p=0.007$; $p=0.040$).²¹ Research by Widja et al, 2019 also showed a significant relationship between work posture and LBP complaints of batik craftsmen in Gianyar, Bali.²²

In the *nyanting* section, batik craftsmen typically adopt a sitting posture with a bent back. This position allows them to easily reach the wax located below by repeatedly using the canting tool.²³ Written batik work requires a high level of precision so that workers often have to bend over or move their head forward to get a closer look during the *nyanting* process.¹⁷

Unnatural working postures can lead to spinal degeneration, thereby elevating the risk of lower back pain. The back muscles exert significant effort, resulting in the production of lactic acid. This accumulation of lactic acid in the metabolism stimulates nociceptors, which in turn generate pain.⁷ Postures held for extended periods can lead to postural strain, placing a static load on the muscles. This strain inhibits blood flow, resulting in a deficiency of oxygen and

glucose, and causing a build-up of metabolic waste products like lactic acid, which leads to pain.¹⁷

The limitations of this research are as follows. First, the research involved a sample size of only 42 participants, which is insufficient to accurately represent the broader population. Second, the observation of REBA scores was conducted over just 24 hours, failing to capture the dynamic changes in the work positions of each participant over time.

CONCLUSIONS

There is a significant of the relationship between work posture and work duration with the incidence of low back pain among batik *nyanting* artisans in pulorejo village

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