Original Research

LOW BACK PAIN AMONG SAMARINDA SARONG'S TRADITIONAL WEAVERS AND ITS RELATED FACTORS

Iwan Muhamad Ramdan[*], Dewi Sartika

Department of Occupational Health and Safety, Faculty of Public Health, Mulawarman University, Samarinda, Indonesia

*Correspondence:
Iwan Muhamad Ramdan
Fakultas Kesehatan Masyarakat, Universitas Mulawarman
Telp: 0541.7031343 Fax. 0541.202699
Email: iwanmuhamadramdan@gmail.com

ABSTRACT

Background: Low back pain (LBP) is a type of musculoskeletal disorder that has a detrimental effect on both workers and business continuity. Weaving activities with handloom are at risk for this disorder.

Objective: To analyze the prevalence of LBP among Samarinda sarong's traditional weavers and its related factors.

Methods: A cross sectional study was conducted on 49 traditional weavers of Samarinda Sarong. The instruments included the Owestry low back pain disability questionnaire, rapid entire body assessment (REBA), microtoise staturmeter and stopwatch. Data were analyzed using multiple logistic regressions.

Results: The result showed that most of the weavers (92.5%) experienced LBP. Age ($p= .000$), work experience ($p=.000$), workload ($p=.048$) and work posture ($p=.000$) were significantly associated with LBP, while nutritional status ($p=.773$) and workload ($p= .343$) were not associated with LBP. Age and work posture were the most dominant variables affecting LBP.

Conclusion: The prevalence of LBP among Samarinda sarong's traditional weavers was quite high and was strongly influenced by the weavers' age and posture work. In order to improve work posture and reduce the incidence of LBP, it is recommended to modify handlooms (tables and chairs) by following ergonomic rules, reducing workload, work time limitation and adequate rest.

Keywords: low back pain, traditional weavers, related factors

BACKGROUND

Musculoskeletal disorders (MSD) are health problems that often occur in the workforce population and have caused considerable losses that ultimately have a detrimental effect on work productivity and business continuity. MSD occur in various industries, both formal and informal sectors. High-risk sector/occupation includes health sectors, transportation sectors, mining, food control, leather tanning and manufacturing (Punnett et al., 2005). MSD have increasingly become prevalent worldwide during the past decade (Gasibat et al., 2017), not only affect the workers' quality of life, but also impose a major economic burden to the society (Wang et al., 2017). MSD also has a highly health cost, constituting a major cause of occupational injury and physical disability in both developed and developing countries (Veisi et al., 2016).

One type of MSD that is often complained by workers is low back pain (LBP). This type of musculoskeletal disorder is very important in terms of clinical, social, economic and public health because it occurs in the majority of the

working population, the prevalence is estimated to be close to 70% in industrialized countries ([Andersson, 1981](#); [Manchikanti, 2000](#)). In developing countries, the incidence of LBP has led to increased rates of absenteeism, reduced work productivity, and increased health costs ([Punnett et al., 2005](#)).

Based on some literature survey, the factors related to LBP consist of job factors and non job factors (personal factors) i.e. working in poor posture, awkward/static postures, vibration, monotonous repetitive movement, prolonged hours of sitting, age, smoking habits, obesity, working time, working experience ([Johansson & Rubenowitz, 1994](#); [Paudyal et al., 2013](#); [World Health Organization, 1985](#)).

One group of workers who are at risk of suffering LBP is the Samarinda sarong's traditional weavers. Samarinda sarong is still done manually using handloom or known as "Gedokan", produced since 1607 and is still maintained because it has a high artistic value and originality, and is an icon of Samarinda city tourism. To produce one sheet of 200 x 80 cm^2 sarong, the weaver takes about 15 days ([Muhamad Ramdan et al., 2018](#)). This study aimed to identify the incidence of LBP on Samarinda sarong's traditional weavers and analyze its related factors.

METHODS

Study design
A quantitative survey with cross sectional design was conducted to analyze the prevalence of low back pain and its related factors among Samarinda sarong's traditional weavers. This study was conducted from August to September 2018 in Sarong Samarinda located in the City of Samarinda, East Kalimantan, Indonesia. All 49 women weavers were selected using a total sampling as respondents in this study.

Instrument
LBP's symptoms were measured using the Owestry questionnaire low back pain disability ([Baradaran et al., 2016](#); [Davidson & Keating, 2002](#); [Fairbank & Pynsent, 2000](#); [Fritz & Irrgang, 2001](#); [Vincent et al., 2014](#)). Nutritional status was measured by the body mass index (BMI) indicator. Work posture was measured by the rapid entire body assessment (REBA). The workload was measured by observing the pulse rate, age and years of service.

Data analysis
Data were analyzed using Pearson product-moment correlation and multiple linear regressions.

Ethical consideration
The study was reviewed and approved by the Ethical Commission of Health and Medical Research, Faculty of Medicine, Mulawarman University Indonesia with approval number: 33/KEPK-FK/IV/2018, which refers to the International Ethical Guidelines for Biomedical Research Involving Human Subjects and the International ethical guidelines for epidemiological studies from Council for International Organizational Organizations of Medical Sciences (CIOMS 2016). Informed written consent was obtained from the participants prior to data collection. The informed consent stated the purpose of the study, data confidentiality, and the voluntary right of participation in the study, as well as provided the guarantee that no participant suffered any harm as a result of his/her participation in the study.

RESULTS

Characteristic of the participants, and its association with LBP prevalence
Most of the weavers (92.5%) experienced LBP (15% light, 77.5% moderate and 7.5% severe). Most weavers were aged more than 35 years (77.6%), married (95,5%), and having elementary school as their educational background (34.7%). It was 79% of weavers having more than 5 years of work experience, 73% of weavers' workload were in low category, 67.3% having normal nutritional status, and 67.3% having medium work

posture. Pearson's product-moment correlation analysis showed that age (p=0.000), working experience (p=0.000), workload (p=0.048) and work posture (p=0.000) had significant correlation with the incidence of LBP (see **Table 1**).

Table 1 Characteristics of Samarinda sarong women weavers (n=49) and the association between variables and LBP prevalence

Variable	Number	(%)	*p*
Age (years)			.000
< 35	11	22.4	
≥ 35	38	77.6	
Marital status			
Not married	2	4.1	
Married	47	95.9	
Education background			
Never went to school (elementary school, did not graduate)	12	24.5	
Elementary school (graduated 6th grade)	17	34.7	
Secondary high school (graduated 9th grade)	6	12.2	
Senior high school (graduated 12th grade)	14	28.6	
Working experience (years)			.000
≤5	10	20.4	
>5	39	79.6	
Workload			.048
≤90 (Low workload category)	36	73.5	
91 – 100 (Medium workload category)	11	22.4	
> 100 (High workload category)	2	4.1	
Nutritional status based on BMI			.727
< 18.5 (malnutrition)	3	6.1	
18.5 – 25 (normal)	33	67.3	
> 25 (excess nutrition)	13	26.5	
Work posture			.000
Medium	33	67.3	
High	16	32.7	
Low back pain (LBP)			
No LBP	4	0.8	
Low	10	20.4	
Moderate	26	53	
Severe	9	18.3	

*) Pearson's product-moment correlation coefficient, the data were normally distributed (Shapiro-Wilk test, p=.724). Significant at the 0.05 level (p<.005)

To run the multiple regressions, all the assumptions were tested. Based on **Table 2**, coefficients obtained VIF values for variables of age (2.142), work posture (1.569), years of service (1.755), nutritional status (1.167) and workload (1.322) respectively, whereas the tolerance values were .467, .636, .570, .857 and .756. Because the VIF values of the five variables were not greater than 10, it can be concluded that there was no multicollinearity.

The Durbin Watson value (DW count) was 1.542, while the DW value was compared with the DL and Du values based on the number of independent variables (five independent variables) in the regression model with a sample size of 49 and a significance level of 5% (α = .05). dL = 1.16 dU = 1.587. The value of DW counted 1.542 was between 1.16-1.587, thus it could be concluded that there was no autocorrelation.

Based on the scatterplot image, the distribution of dots did not form a particular pattern / plot, so it could be concluded that heteroscedasticity did not occur. Based on the normal p-p plot, the distribution of points approached a straight line (diagonal), it could be concluded that the data were normally distributed (see **Figure 1**).
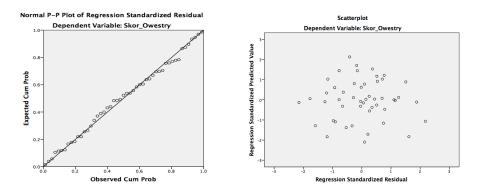
Figure 1 Result of heterocedasticity and normality test

One way Anova test to determine the value of F distribution obtained the value of .000 (<.05), which can be concluded that the estimation model was feasible. The results of the t test obtained only two variables that had a significance value below the value of α = .005, namely age (α = .002) and work posture (α = .001). So with a 95% confidence level, only variable age and work posture had a significant effect on the incidence of LBP. The R Square value of 0.653 illustrated that the proportion of age and work posture affected the incidence of LBP by 65.3%, while the remaining 34.7% was influenced by others.

Table 2 The result of the regression analysis of LBP by Owestry score

	B	SE	β	t	p	Tolerance	VIF
Constant	-6.541	7.096		-.922	0.362		
Age	0.184	0.056	0.435	3.306	0.002	0.46	2.142
Work posture	2.823	0.800	0.397	3.351	0.001	0.637	1.569
Work experience	0.048	0.066	0.086	0.722	0.474	0.570	1.755
Nutritional status	0.019	0.162	0.011	0.118	0.907	0.857	1.167
Workload	-0.027	0.058	-0.047	-0.458	0.649	0.756	1.322

Durbin Watson=1.542, R^2=0.653 Anova F=16.198 p= .000

The results of the analysis showed a positive sign, which indicated a unidirectional relationship. If the independent variable increases, the dependent variable will experience the same thing. The regression equation of the results was:

$$\begin{aligned} \text{LBP} &= -6.541(\text{constant}) + 0.184\ \text{age} + 2.823\ \text{work posture} + e \\ Y &= -6.6 + 0.18\ (45) + 2.82\ (8) + e \\ &= -6.6 + 8.1 + 22.58 \\ &= 24.264 \end{aligned}$$

The narrative of the equation was: each increase in age 1 year and an increase in 1 work posture score will increase the risk of LBP events 24.26 times.

DISCUSSIONS

LBP prevalence
The LBP symptoms prevalence was relatively high among the weavers of Samarinda Sarong (92.5%) and was dominated by moderate-level of LBP (50.3%). The results indicated that the LBP experienced by the weavers of Samarinda sarong were very serious and required immediate intervention. Weavers who have experience LBP may have low productivity. This was in line with previous study showed that LBP is associated with considerable absence from work and loss in productivity, resulting financial burdens to employers, employees and health care systems (Punnett et

al., 2005). In this study, LBP were subjectively using the Owestry low back pain questionnaire. Although these measurements are considered valid and reliable (Vincent et al., 2014), advanced research using objective measurement, such as medical examination, is needed to justify the LBP experiences among these weavers.

Factors that affected LBP prevalence

Age of the weavers
The majority of age distribution of the weavers in this study was ≥ 35 years (77.5%). We showed that the age of the weavers has a significant correlation with LBP prevalence, which can be explained due to the presence of a degenerative process and accumulation of spinal damage (Ozguler et al., 2000). This result is similar to some reports about the correlation between age and LBP prevalence (Ahmed, 2016; Çınar-Medeni et al., 2015; Hameed, 2013).

Working experience
The working experience of Samarinda sarong's weavers were divided primarily into two different categories, i.e., weavers with <5 years (20.4%) and ≥5 years (79.6%) of working experience. Working experience was associated with LBP prevalence. To reduce more severe LBP due to an increased working period, the workload and working hours should be reduced and the weavers should receive adequate rest and proper work conditions (Luttmann et al., 2003).

Workload
The workload of the Samarinda sarong's weavers were divided primary into three different categories, i.e. low (73.5%), medium (22.4%) and high (4.1%). Workload was associated with LBP prevalence. This finding is similar with previous study that concluded workload as risk factors to LBP (Burdorf & Jansen, 2006; Xu et al., 2012). In accordance with working experiences variable, to reduce more severe LBP, the workload and working hours should be reduced and the weavers should receive adequate rest and proper work conditions (Luttmann et al., 2003).

Work posture
The work postures of the weavers in this study were significantly associated with LBP prevalence ($p<.001$). The weavers' activities are monotonous movements that require lifting weights, twisting and bending. These data confirmed previous reports showing that work posture was significantly associated with LBP prevalence in garment industry workers in Eastern Oromia Ethiopia (Tafese et al., 2008), in some occupations in France (Ozguler et al., 2000), in Chinese coal miners (Xu et al., 2012), among workers in some small-sized factories in Ardabil, Iran (Mazloum et al., 2006), and in automobile industry workers in India (Jamdade et al., 2018).

This finding implies that construction of an ergonomic handloom based on the anthropometric measurements of a woman weaver's body is highly required to prevent adverse effects on the weaver's musculoskeletal system.

CONCLUSIONS

The LBP prevalence of the traditional weavers of Samarinda sarong was approximately 92.5% and was categorized as low (20.4), moderate (53.0) and severe (18.3%), respectively. These LBP were associated with the age, working experience, workload and work posture of the weavers. To reduce the severity of LBP experienced by weavers, the handloom should be redesigned based on the anthropometry of the weavers, workload and working time must be reduced, and giving adequate rest times.

Author contributions

IWR: data collection, investigation, supervision, validation, preparing, writing, and reviewing and editing manuscript. **DS**: conceptualization, formal analysis, methodology, resources, validation.

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