

Analysis of Factors Related to the Fatigue of Work on the Part of Production Workers at Pt. X Wonogiri

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Abstract

Work fatigue was feeling fatigued and discomfort the body related to work activities in a long time. The manifestation of a sense of weary marked with increasing concentration of blood lactic acid. Work fatigue is one of the problems for the health and safety of workers. PT. X is a manufacturer of traditional medicines (herbal) of high quality and cutting edge located in Wonogiri. Information from the company's clinics showed that each day approximately 10 people complaining of tired workers. This research aims to analyze the factors related to work fatigue using indicators increase in blood lactic acid concentration on production worker PT. X at the packaging. This research is quantitative research with cross sectional design research that was carried out in December to January 2014-2015. The research results obtained from 40 respondents, respondents overall increase blood concentration of lactic acid. Job factors i.e. time is working with great value relationships is highest at the onset of fatigue of working with indicator of the increase in the concentration of blood lactic acid, this is indicated by the value of the Sign. 0,061, through calculations with SPSS Regression logistic. The suggested recommendations in the management, namely providing facilities against worker like gymnastics with physical freshness for workers to maintain fitness nutritional, socialization work workers that reduces fatigue by giving sufficient caloric intake and socialization of ergonomics that reducing tiredness with attitude and an ergonomic way of working.

Keywords: job Burnout, lactic acid, production workers

1. Introduction

PT. X is a manufacturer of traditional medicines (herbal) of high quality and cutting edge located in Wonogiri. The production process at PT. X is done in several stages of the process of one of them, namely packing process. Information from the company's clinics showed that each day approximately 10 people complaining of tired workers. Do not cover the possibility of the complaints result from the production of packaging products syrup Y sachet.

Activities on the part of packaging allows workers can experience fatigue during the work in progress. Workers must chase the target or being able to pack the product syrups Y sachet as much as 1200 sachets per hour per person. Activity in the parts of the packaging is done by the majority of women workers in the form of work is monotonous, repetitive movements (repetitive) and a daily routine with a static posture and sitting position.

Based on these reasons then this research aims to elucidate more in-depth about the factors associated with the occurrence of fatigue of working with indicator of the increase in the concentration of blood lactic acid in PT. X Wonogiri.

2. Method

This research has a method of quantitative research approach with the kind of observational and research approach of cross sectional. This research was conducted at PT. X Wonogiri, Central Java. As for the time the research was conducted in December 2001 – January 2015. In this study used sampling by means of simple random sampling. The population in this research totalled 80 workers. Calculations using the large sample formulas obtained as many as 40 people.

In this study used sampling by means of simple random sampling. The population in this research totaled 80 workers. Calculations using the large sample formulas obtained as many as 40 people. Data collection techniques using interview techniques to get the information age and the time of work, observation and measurements include measuring nutritional status using the body mass index indicator (IMT) with gauges of weight and height, physical workload measurement tool Calorimeter Heart Rate Watch and work fatigue measurement using indicators increase in blood lactic acid concentration with Roche Accutrend ® Plus brands. Data analysis using multivariate logistic regression with the test.

3. Result

Based on table 1 obtained that respondents with mild most of the workload increase blood concentration of lactic acid $\leq 0,565$ mmol/l blood. Respondents with a heavy workload most increase blood concentration of lactic acid $> 0,565$ mmol/l blood. Respondents who have working period ≤ 15 years most of the rising concentration of blood lactic acid $\leq 0,565$ mmol/l bloods. Respondents who have working period > 15 years most of the increase in blood lactic acid concentration $> 0,565$ mmol/l blood.

Table 1 Relationship of Job Factors and Factor Characteristics of workers with the Fatigue of work Using Indicators increase in Blood lactic acid concentration of Workers

Independent Variable		The Dependent Variables: Work Fatigue Using Indicators Increase In Blood Concentration Of Lactic Acid				Sig.	Exp (B)	Conclusion
		$\leq 0,565$ mmol/l blood		$> 0,565$ mmol/l blood				
		n	%	n	%			
The Workload	Light	18	60,00	12	40,00	0,069	0,186	Significant
	Heavy	3	30,00	7	70,00			
Working Period	≤ 15 years	17	63,00	10	37,00	0,061	0,166	Significant
	> 15 years	4	31,00	9	69,00			
Age	$\leq 38,5$ years old	13	59,00	9	41,00	0,264	2,381	Not Significant
	$> 38,5$ years old	10	56,00	8	44,00			
Nutritional Status	Normal	12	48,00	13	52,00	0,073	5,272	Significant
	Obese	9	60,00	6	40,00			

Respondents who have aged ≤ 38.5 years or who have aged > 38.5 years largely increase the concentration of blood lactic acid $\leq 0,565$ mmol/l blood. Respondents with the nutritional status of normal category largely increase the concentration of blood lactic acid $> 0,565$ mmol/l blood, while respondents with nutritional status most obese category increase blood concentration of lactic acid $\leq 0,565$ mmol/l blood.

Logistic regression test results indicate that the workload, working period and nutritional status is a factor related to the fatigue of work on the part of production workers at the PT X. This outcome may be known from the value significance of the value $< \alpha$ (α), namely < 0.10 . This research uses the value significance of 0.10 (10%) means the level of error in this research by 10% and the level of his conviction by 90%. Use a value of 0.10 significance because it did not have a great impact for the health of workers. The main factor and dominant fatigue-related work that is work time.

Respondents with a light workload risk of 5,417 times more likely not experiencing the fatigue of work compared to respondents with a heavy workload. Respondents with work period ≤ 15 years had a risk of 6,024 times more likely not to experience the fatigue of work compared to respondents with work period > 15 years. The results of the logistic regression test on a variable nutritional status indicates that the respondents have Beefy nutritional status at risk amounted to 5,272 times more likely not to experience the fatigue of work compared to respondents who have normal nutritional status.

4. Discussion

4.1 The Workload

Logistic regression test results show that magnitude of significance to the workload value = value and significance to 0,069 working period = 0,061, then it can be inferred that there is a relationship between the workload with the fatigue of work, with the significance of the values of the $< \alpha$ (α), namely < 0.10 .

The workload increases oxygen consumption increases proportionally to the maximum conditions are obtained. A higher workload cannot be done in conditions of aerobics, due to insufficient oxygen content for an aerobic process. According to Nurmiyanto (2003) manifestation of a sense of tired with marked the increasing lactic acid content. According to Janssen (1987) in Purnomo (2011) high lactic acid can arise as a result of heavy workload, this is because of the inability of the aerobic energy system supplier, so that the supply of energy from an energy source aneorobik dominate. High intensity exercises will increase the levels of lactic acid.

The results of the measurement of the workload shows that almost all workers including a light workload categories i.e. as many as 30 people respondents from 40 people total respondents. The respondents included in the category has a light workload but it can be associated with fatigue. The assumption that the existence of researchers factored the additional workload resulting from the working posture can also affect the workload of

workers. The respondent has a light workload risk of 5,417 times larger did not experience fatigue work compared to respondents with a heavy workload.

According to Suma'mur (2009) the attitude of the body in the work is the attitude that ergonomics so that work efficiency achieved optimum productivity and with a sense of comfort in work. Incorrect posture in the works will affect the fatigue of work. In doing her job the respondents have no ergonomic posture.

Becker et al (1999) in Santoso (2013) argued, "When the intensity of muscular work increases, then the oxygen supply is insufficient. Under such conditions, it takes an additional ATP provided through MEA. MEA also results in increased concentration of lactic acid and glycogen decreased. In the MEA, kreatinfosfat remains the predominant use for re-synthesis of ATP. Most ATP synthesis is filled by using the energy released through anaerobic decomposition of glucose into lactate".

4.2 Working Period

Logistic regression test results show that magnitude value of significance for the work = 0,061, then it can be inferred that there is a relationship between the time of work with the fatigue of work, with the significance of the values of the $< \alpha$ (α), namely < 0.10 .

According to Sedarmayanti (1996) long work is one of the factors included in the components of the health sciences. The physical work is done continuously for a long period of time to the mechanisms in the body. Fatigue occurs due to residual products inhibit the muscle and blood circulation in which the rest of this product limits the survival activity of muscles.

The data obtained showed that the average time of employment of the respondents for 16 years. It can be said that the majority of respondents had long worked in the packing section by performing the same activities every day. Respondents with masa work ≤ 15 years had a risk of 6,024 times larger did not experience fatigue work compared to respondents with masa $>$ work 15 years. Fatigue occurs due to a recurring job facing repeated (repetitive) and monotonous. The labor continuously perform the same movement for a long time then disturbed blood circulation, decreased work efficiency and labor becomes quickly fatigued.

4.3 Age

The results of the logistic regression test indicates the magnitude of the value of significance to age = 0,264. The value of significance to age $>$ value of alpha (α) namely > 0.10 , then it can be concluded that there is no relationship between age with fatigue. Tarwaka (2004) argues, "the Age of a person in relation to the direct physical capacity to some extent and reaches its peak at the age of 25 years. Aged 50-60 years of muscle strength decreased by 25%, sensory capabilities-motoris decreased by as much as 60%. The ability of one's physical work with age more than 60 years to reach 50% of people with 25 years of age". This research does not comply with the existing theory. This research shows that age is not related to fatigue.

According to the Fox (1993) in the body, lactic acid is produced continuously in the cytoplasm. However the amount of lactic acid in the body is relatively fixed. In healthy people in a State of rest, being the amount of lactic acid is approximately 1-2 mmol/l, 1-1.8 mmol/l. Assumption researchers that because lactic acid is produced continuously in the body then the age did not have a meaningful relationship with the fatigue of work using an indicator of the increase in the concentration of blood lactic acid.

4.4 Nutritional Status

The results of the logistic regression test indicates the magnitude of the value significance of nutritional status = 0,073. The value of significance to the value of nutritional status $<$ alpha (α), then it can be $0.10 <$ concluded that there is a relationship between the nutritional status with the fatigue of work. Jusuf in Budiono (2003) explains that the workforce with good nutrition has the capacity and resilience of the body work better. The nutritional condition of work appropriate light weight work also affects the level of the health workforce. The results of the logistic regression test on a variable nutritional status indicates that the respondents have Beefy nutritional status at risk for not experiencing the fatigue of work amounted to 5,272 times greater compared to respondents who have normal nutritional status.

The respondents in this study most have normal nutritional status by category. Although the respondent had normal nutritional status by category but it is related to fatigue. The main source of the body's energy is carbohydrates, fats and proteins. The third of these nutrients each have two phases in line catabolism to produce energy. Sediaoetama (2012) in his book says that, the first phase in the process of catabolism is a special phase of any nutritional elements i.e. carbohydrates, fats and proteins. The second phase is the phase along the third element of nutrition, which the metabolite as a result of the first phase of further processed in oxidative energy into chemical Adenosine Triphosphate metabolite contained in the (ATP).

This common phase is a cyclical reaction chain called the Krebs Cycle. Krebs Cycle in the entrance of fuel in the form of the first phase of the metabolite katabolisma carbohydrates, fats and proteins, and the ATP generated a rich bond energy and bond the rest of CO₂ and H₂O. ATP available to participate directly in a variety of reactions that require energy while releasing the clusters of phosphate and provide energy while turning into Adenosine Diphosphate (ADP).

The first phase of the breakdown of carbohydrates that produces the metabolite burned in the Krebs Cycle called Embden Meyerhoff Pathway. This line starts from glucose or glycogen and ends with the formation of pyruvic acid metabolite. This route took place in anerobik, meaning that it does not require oxygen comes from breathing air. If the pyruvic acid burned more in Cycle Krebs, decarboxylate and resulting acetyl-coenzim a. Acetyl-CoA then releases a cluster of acetylnya into the Krebs Cycle reactions. Pyruvat acid decarboxylation needs enzyme requires thiamin (vitamin B1).

Embden Meyerhoff Pathway generates ATP, but most used back to launch these reactions. When processing pyruvate is further hampered, will be buried in pyruvic acid. So to avoid that, the body will be the reduction of pyruvic acid into lactic acid, and both of these acids are streamed to the liver for further modified into carbohydrates. Most pyruvic acid enters directly into the Krebs Cycle reactions, so the inclusion of the results of carbohydrate catabolism occurs in two places of the cycle, the Krebs as pyruvic acid and as released from the acetyl group Acetyl-CoA.

Sediaoetama (2012) argues, "the conversion of Pyruvate into Acetyl CoA occur with decarboxylation process requiring ko-an-enzyme that contains vitamin B1 (thiamin). Thiamin deficiency, occurring on the barriers in the process of metabolisma carbohydrates at the point of the reaction, so buried by pyruvic acid and lactic acid".

5. Conclusion

Based on the results and discussion, conclusions can be obtained as follows:

1. Job factors namely workload and working time and worker characteristics factors namely nutritional status is associated with fatigue.
2. The main factor and dominant fatigue-related work that is work time.

Based on the conclusions obtained advice that can be given to the company and the respondents are:

1. Provide facilities against worker like gymnastics with the physical freshness for workers to maintain fitness workers.
2. Socialization of nutrition work that reducing tiredness by giving sufficient caloric intake.
3. Socialization of ergonomics that reducing tiredness with attitude and an ergonomic way of working.
4. Suggestions for the respondent should stretch the muscles in the middle of the activity or after work to help with the recovery and improve the flow of blood.

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