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Submission date: 11-Sep-2019 12:05PM (UTC+0800)

Submission ID: 1170625724

File name: KARIL_PROF_TRI_2019_8.pdf (377.64K)

Word count: 2930

Character count: 15564

An Analysis About the Influence between Occupational Factors and Work Environment on *Abortus* Occurrence in Female Workers at Pt. X Sidoarjo

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Abstract

Abortus is secretion of the conception before being able to live outside the womb with weight less than 1000 grams or gestational age less than 20 weeks. The risk factors for the miscarriage occurrence are encountered in PT.X workers which located in Sidoarjo district, including the existence of company regulations to apply shift work for workers and workers' perceptions about their work environment. The purpose of this study was to analyze the effect of job risk factors such as working hours, work shifts, and work environment factors such as noise, temperature, and vibration with the occurrence of *abortus* in female workers at PT. X Sidoarjo District.

The design of this study was cross sectional with observational study type. The respondents of this study were female workers with total of 192 people. The independent variables of this research were work factors and work environment factors. The dependent variable in this study was the incidence of *abortus* in female workers.

A total 28.64% of the respondents had experienced *abortus*. Logistic regression analysis found that there was a significant correlation between work shift and *abortus* incidence ($p = 0.020$) and between exposure of the machine-induced vibration and *abortus* occurrence ($p = 0.006$).

We recommended for the company to make a schedule regulation about the work shift and taking routine environmental measurements, so the risk of abortion occurrence in female workers due to occupational factors and work environment can be minimized.

Keywords: Duration of Working Hours, Work Shifts, Physical Work Environment, *Abortus* Occurrence, Female Workers.

Introduction

Life and work are something that can't be separated, if people want to live then they have to work. For human, work is a basic need for the fulfillment of needs

and desires, both for men and women. Work is defined as an economic activity undertaken by a person with the intention of obtaining or help to obtaining an income or profit in his life. The more job opportunities which currently occur, does not rule out women entry into the job world¹.

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Along with the development of the industrial world, female and male workers are often exposed to various risk factors that potentially threaten their health, including reproductive health. WHO mentions reproductive health concerning processes, functions, and reproductive systems at the stage of life. Thus

reproductive health is an important element for the health of both women and men². One of the reproductive problems for working women is a pregnancy disorder in which case is the incidence of *abortion*. *Abortion* is the secretion of conception before being able to live outside the womb with fetal weight less than 1000 grams or gestational age less than 20 weeks³.

WHO data¹ suggests an estimated 4.2 million *abortion*s occur annually in Southeast Asia, with details: 1.3 millions occur in Vietnam and Singapore, 750,000 to 1.5 million in Indonesia, 155,000 to 750,000 in Philippines, and 300,000 to 900,000 in Thailand, as well as no estimates of *abortion* in Cambodia, Laos and Myanmar. In Indonesia, the current prevalence of *Abortion* is currently estimated at 7-14% i.e 560,000 - 1,100,000 incidents of *abortion*. The number of *abortion* in Indonesia is quite high. It is estimated that the contribution of *abortion* to maternal mortality can reach 30-50 percent. The most common pregnancy complication in pregnancy especially in the first trimester is *abortion*⁴. The main cause of maternal death are bleeding (60%), infection (25%), *gestosis* (15%) and *abortion*, including bleeding in early pregnancy. As a result of the bleeding 28% can cause maternal death, it is unpredictable and the occurrence is very abrupt⁴.

Several factors are predisposing for *abortion* such as parity factor and mother's age. The risk of *abortion* is higher with increased parity and maternal age. According to the author's opinion, the age of pregnant women will affect the incidence of *abortion*. The older the pregnant women the more likely the *abortion* will occur. The theory conveyed by Littler (2010) that is from a number of *abortion* that occurred, he found that if the mother is older than 35 years old then the risk factor affecting *abortion* is higher. The frequency of clinically detectable *abortion* is increased by 12 percent in women younger than 20 to 26 percent in those over 40 years old¹³.

One of the risk factors of *abortion* in working women who is pregnant arises from occupational activity and work environment called occupational risk factors⁵. Several previous studies have shown that long working hours with the work shift system, and exposure to physical factors in the workplace, such as lifting and standing activities, can increase the risk in pregnant women⁶. Factors which is related to the female work environment such as exposure to an anesthetic gas, noise, temperature and vibration may be associated with

a risk of spontaneous *abortion*⁷.

The older the women's age during pregnancy is a strong risk factor because it deals with the quality of the ovum rather than the woman's ability to give birth. However, miscarriage that occurs in the workplace is also not uncommon, this is due to the existence of known hazard factors and potentially cause the problem of pregnancy which is the occurrence of *abortion*⁶.

The presence of reproductive health disorder experienced by female workers can lead to lack of work productivity resulting in inefficient production costs. This is due to the higher reproduction disorder experienced by female workers, then the level of likelihood of absenteeism will also be higher so it will decrease the value of work performance and productivity⁸.

The aim of this study was to analyze the influence of job risk factors such as working hours, work shifts, and work environment factors such as noise, temperature, and vibration with the occurrence of *abortion* in female workers at PT. X Sidoarjo District.

Material and Method

The design of this study is cross sectional with observational study type. The respondents of this study were female workers with total of 192 people. The independent variables of this research were job factors (long working hours and work shifts) and work environment factors (noise, temperature and vibration). While the dependent variable in this study was the incidence of *abortion* in female workers.

This study was conducted at PT. X located in Sidoarjo District and implemented from October to November 2017. PT. X is a company engaged in the manufacturing of plastics.

Data collection techniques were included general data, job history (working hours and work shifts), work environment data (noise, temperature, and vibration), and pregnancy history by filling out the questionnaire. Analytical methods were used descriptive analysis and bivariate analysis.

Findings

Duration of Work

The duration of respondent's working hours in this study was divided into two categories, namely <

8 hours and ≥ 8 hours. Most of the respondents in this study worked ≥ 8 hours as many as 190 (98.95%) and 2 respondents worked < 8 hours (1.04%).

Working Shift

In the company where the study was conducted, they applied shift work system for workers in the production (non-office) i.e morning shift, afternoon and night. Most respondents work with shift work system of 145 respondents (75.52%). While a small percentage of respondents work without shift work system of 47 respondents (24.47%).

Noise

Based on the result of the study, we found that most of the respondents feel that their work environment is noisy as many as 150 respondents (78.12%) and 42 respondents (21.87%) stated that their working environment is not noisy.

Temperature

Based on the result of the study, we found that most of the respondents feel that their working environment is hot and often feel swelter as 170 respondents (88.54%) and 22 respondents (11.45%) stated that they do not feel swelter at work.

Vibration

Based on the results of the study, we found that a small percentage of respondents work by using non-vibrating machines as much as 75 respondents (39.06%) and 117 respondents (60.93%) stated that they work by using a vibrating machine.

Abortus

A small percentage of respondents had experienced *abortus* were 55 respondents (28.64%) and 137 respondents (71.35%) had never had *abortus*.

Test Results of the Effect Between Occupational Factors and Work Environment on *Abortus* Occurrence in Female Workers

Table 1. The Test Results of the influence

Independent Variable		Dependent Variable		
Variable	Category	Abortus Occurrence		p-value (0.05)
		Yes N (%)	No N (%)	
Duration of Work	≥ 8 working hours	55 (28.94)	135 (71.05)	0,999
	< 8 working hours	0 (0)	2 (100)	
Working Shift	Shift	48 (33.10)	97 (66.89)	0,020
	Non Shift	7 (14.89)	40 (85.10)	
Noise	Yes	42 (27.81)	109 (72.18)	0,625
	No	13 (31.70)	28 (68.29)	
Temperature	Yes	49 (28.82)	121 (71.17)	0,880
	No	6 (27.27)	16 (27.27)	
Vibration	Yes	30 (40)	45 (60)	0.006
	No	25 (21.36)	92 (78.63)	

The result of the test in Table 1 shows that the independent variables that have significant effect on the variable of *abortus* occurrence are work shift variables and vibration variables due to the exposure of the machine at work. It can be seen from the probability value (*p-value*) of logistic regression test of working shift variable is 0.020 and the vibration variable is 0.006.

One of the occupational factors that affect the incidence of *abortus* in female workers is the presence of work shift in the work. Work shift includes rotation variable and irregular work schedule. Study showed that the more irregular hours a person has to work, the greater the circadian cycle changes, the greater the pressure on the worker so that it can interfere the reproductive system. Women who work on afternoon and night shifts, rotation or schedule changes require greater attention. Work shift is also associated with the increase of miscarriage in the first trimester, preterm birth, and low birth weight⁵.

² Based on the results of the study above, we obtained the results of female workers who run the work shift never experienced the occurrence of *abortus* that is equal to 33.10% with a significance value of 0.020. This study was in accordance with Eskenazi's (1994) study, based on a case-control study which found an increased risk of spontaneous *abortus* for work shift and work at night⁹. MacDonald *et al* also found that female workers who were working with the shift system may increase the risk of spontaneous *abortus*. Other studies conducted in China have also found that women who work with irregular working hours or rotation shift systems will increase the risk of miscarriage¹⁰.

The mechanism that may underlies the causal relationship between night work and miscarriage is the recurrence of circadian rhythm in night workers and is associated with the decrease of melatonin secretion from lack of sleep. This can interfere sex hormone homeostasis, implantation and fetal growth. In addition, if this thing continues to occur during pregnancy it is known to increase the risk of spontaneous *abortus*¹¹. This theory is supported by study conducted in Thailand which showed that work shift will lead to the emergence of irregular working hours. It may be associated with the increased risk of spontaneous *abortus* and reduced fertility. The mechanism which involved in the process may include changes in circadian rhythm along with hormonal concentration changes, which may affect both the conception and normal development of the fetus.

³ The cohort study on Nurse Health showed significantly increased estradiol levels and decreased melatonin excretion after several nights of work⁹.

Abortus provides general symptom of abdominal pain due to uterine contraction, bleeding and along with the expenditure of all or part of the conception. The forms of bleeding vary greatly in small amounts and last for a long time, then at the same time in large amounts with clots, and as a result of bleeding can cause symptoms such as shock, increasing pulse, low blood pressure, anemic appearance, and cold fingertips⁴.

The vibration which felt by the body due to the use of the machine while working contributes to the occurrence of various reproductive problems, especially in pregnant women. In addition to causing impaired menstruation, exposure to the vibration of the engine can also cause miscarriage⁵. Based on the results, we obtained that respondents exposed by a vibrating machine experienced *abortus* as much as 40% with a significance value of 0.006. This study is supported by a study conducted in America which stated that persistent exposure to vibration and noise in pregnant women can increase the risk of negative reproductive effects such as infertility, menstrual disorders, spontaneous *abortus* and premature birth. Exposure to vibration can cause impaired blood circulation in the pelvic area of pregnant women¹².

The effect of vibration released from noise are rarely studied, however, one study in Europe showed that women who are often affected by vibrations resulting from their work can cause serious problems for their reproductive health such as toxemia, complications of labor and may even increase perinatal mortality¹².

Conclusion

As much 55 respondents had (28.64%) had experienced abortion in their life.

Most of the respondents work with ≥ 8 hours duration and have experienced abortion incidence by 55 respondents (28.94%). While respondents who work with a working time < 8 hours, only 2 people and never experienced abortion.

Most of the respondents who work in work shift and have experienced abortion occurrence by 48 respondents (33.10%).

Most of the respondents who felt their working environment is noisy and have experienced abortion is 42 respondents (27.81%).

Most respondents who felt their working environment is hot and often feel swelter at work and have experienced abortion is 49 respondents (28.8%).

A small percentage of respondents who work with a vibrating machine were constantly exposed to engine vibrations and have experienced abortion incidence are 30 respondents (40%).

Based on the result of statistical test, there was a significant effect between work shift, and vibration exposure on the occurrence of abortion with p -value $<0,05$. Work shift will results in irregular working hours. It may be associated with the increase of spontaneous abortion and reduced fertility risk. In addition, persistent vibration and noise in pregnant women may increase the risk of negative reproductive effects such as infertility, menstrual disorders, spontaneous abortion and premature birth.

Conflict of Interest: None

Source of Funding : Departement of Occupational Health and Safety, Public Health Faculty, Airlangga University, Surabaya, Indonesia

Ethical Clearance: The data was collected after the study proposal passed the ethical clearance and passed by Health Research Ethics Commission of Faculty of Public Health Airlangga University. All study respondents have been given explanation and information about the purpose and method of this study and have signed the form of willingness to be a respondent.

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