

CORRELATION OF LEAD LEVEL (Pb) IN AIR AMBIENCE WITH THE NUMBER OF SPERM CELLS IN GAS STATION MEN'S OFFICERS IN PEMATANGSIANTAR IN 2019

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ABSTRACT

Background: Lead (Pb) is one of the dangerous air pollutants that contain a lot of vehicle fuel. Reports from three gas station locations in Pematang Siantar City are gas stations with gas station operating time for 24 hours so that various types of vehicles require a lot of fuel to fill fuel at this gas station. The purpose of this study was to analyze the relationship of lead levels (Pb) with sperm cell counts in male gas station officials in the city of Pematangsiantar in 2019.

Materials and Methods: Design an observational analytic study using Cross Sectional. The population is male gas station officials who issue 14,211,205 gas stations, 14,211,206 gas stations and 14,211,211 gas stations as many as 36 people. The sample uses a total population. Data analysis used univariate and bivariate.

Result: The results of the study with the chi-square test showed that the sig value of the variable lead content in ambient air = 0.007, working time = 0.002, working time = 0.003 and the use of PPE = 0.016.

Conclusion: There is a significant relationship between lead levels, length of work, working time and use of PPE and sperm counts for male gas station officers in Pematangsiantar City in 2019.

Keywords: Lead Level (Pb) in Ambient Air, Sperm Cell Count, Male Gas Station Officer

1.0 Introduction

Air pollution generally occurs in densely populated areas and many industrial activities such as in big cities, causing new concerns for the community, namely the impact of air pollution on public health. In 2004, 32.300 people in Indonesia died every year due to environmental problems, namely air pollution. This shows that developing countries tend to face air pollution problems more often than developed countries. WHO also states that the air pollution threshold value for cities in Asia often exceeds the established raw material. Six pollutants that seriously pollute the air according to the EPA, including ozone (O₃), carbon monoxide (CO), sulfur dioxide (SO₂), nitrogen oxides (NOX), particulates (PM₁₀ and PM_{2,5}) and lead.

Environmental health has been implemented in primary level health facilities, in accordance with the Minister of Health Regulation No.13 of 2005, where each public health center is required to provide environmental health services in the form of counseling, environmental health inspections, and or environmental health interventions (Ministry of Health, Republic of Indonesia, 2015).

Government, in Government Regulation No. 41 of 1999 states that air pollution is the entry or insertion of substances, energy, and other components into ambient air due to human activities so that the quality of ambient air drops to a certain level which causes ambient air cannot fulfill its function.

There have been many studies conducted on air pollution. For the Southeast Asian region, there is an increase in the levels of very small particles measuring less than 2.5 microns or PM_{2.5} from previous years in 2018, where these particles are very easy to settle to the respiratory tract and can cause interference (World Health Organization [WHO], 2018).

Lead (Pb) is one of the dangerous air pollutants sourced from the combustion of motor vehicle fuel. Lead is soft metal, has a high density and has a stable half-life so that it exists on earth naturally and is free in a very long time. Lead has toxic properties that can interfere with the nervous system of humans and animals when ingested.

2.0 Materials and Methods

The research design used was observational analytic with the research design used was cross sectional to determine the relationship between effects (dependent variable) with risk factors (independent variables). The population in this study were male gas station officials who served at the SPBU 14,211,205, SPBU 14,211,206 and SPBU 14,211,211 as many as 36 people. Sampling uses a sample system (total population). Analysis of the data used in this study is univariate and bivariate.

3.0 Result

Table 1. Frequency Distribution of Age Categories, Lead Levels, Length of Work, Working Time, Use of PPE and Sperm Count at Gas Station 14,211,205, Gas Station 14,211,206 and Gas Station 14,211,211 Pematangsiantar City in 2019

Variable	Frequency (f)	%
Age		
17 – 25 years	1	2,8
26 – 35 years	15	41,7
36 – 45 years	18	50,0
> 45 years	2	5,6
Lead Content		
Gas Station I	2,1121	-
Gas Station II	0,1973	-
Gas Station III	1,8973	-
Length of Working		
No Risk (≤ 3 tahun)	25	69,4
Risk (>3 tahun)	11	30,6
Working Time		
No Risk (< 8 jam / hari)	27	75,0
Risk (≥ 8 jam / hari)	9	25,0
PPE Usage		
Complete	15	41,7
Incomplete	21	58,3
Sperm Count		
Normal	23	63,9
Abnormal	13	36,1

3.1. Univariate Analysis:

Based on table 1, the results of data collection based on the age of male gas station staff out of 36 number of gas station workers that the age category of 17-25 years were 1 person (2.8%), aged 26-35 years as many as 15 people (41.7%), aged 36-45 years as many as 18 people (50.0%) and officers aged > 45 years as many as 2 people (5.6%). The results of the ambient air lead study showed that from 3 SPBU measured the lead level was 2 measurement points with low lead content ($\leq 2 \mu\text{g} / \text{Nm}^3$) as many as 2 gas stations and 1 SPBU with high lead content ($< 2 \mu\text{g} / \text{Nm}^3$). The results showed that of 36 male gas station workers the majority of officers worked for ≤ 3 years (no risk) as many as 25 people (69.4%) and those who worked for > 3 years (at risk) as many as 11 people (30.6%). The results showed that the majority of 36 SPBU officers worked (< 8 hours / day as many as 27 people (75.0%) and those who worked ≥ 8 hours / day as many as 9 people (25.0%). The results showed that of 36 the majority of male SPBU officers are incomplete in using PPE as many as 21 people (58.3%) and the complete officers use PPE as many as 15 people (41.7%). The results of the study show that of the 36 male SPBU officers the majority have normal sperm counts as many as 23 people (63.9%) and those who have abnormal sperm counts as many as 13 people (36.1%).

Table 2. Cross Tabulation of Relationships of Lead Levels in Ambient Air, Length of Work, Time of Work and by the Number of Sperm Cells in Male Gas Station Officers in Pematangsiantar City in 2019

Variable	Sperm Count				Total		p value	PR
	Normal		Abnormal		f	%		
	f	%	f	%				
Lead Content								
Low	19	52,8	5	13,9	24	66,7	0,007	2,375
High	4	11,1	8	22,2	12	33,3		
Length of Working								
No Risk	20	55,6	5	13,9	25	69,4	0,002	2,933
Risk	3	8,3	8	22,2	11	30,6		
Working Time								
No Risk	21	58,3	6	16,7	27	75,0	0,003	3,500
Risk	2	5,6	7	19,4	9	25,0		
PPE Usage								
Complete	13	36,1	2	5,6	15	41,7	0,016	1,820
Incomplete	10	27,8	11	30,6	21	58,3		

3.2. Bivariate Analysis:

Based on table 2 of the results of the study, from 36 numbers of male gas station staff found that from 24 male gas station workers working at gas stations with low ambient air lead levels as many as 19 people (52.8%) the number of normal and abnormal sperm counts 5 people (13.9%). Of the 12 officers who worked at gas stations with high levels of lead in ambient air as many as 4 people (11.1%) the number of sperm was normal and 8 of them were abnormal (22.2%). Chi-square statistical test results obtained p value 0.007 <0.05. The results of the 36 officers found that of the 24 officers who worked at gas stations with a long time at work as many as 20 people (55.6%) the number of normal sperm and 5 people (13.9%) were abnormal. Of the 11 officers who worked at the gas station with a long work time as many as 3 people (8.3%) the number of sperm was normal and 8 people (22.2%) were abnormal. Chi-square statistical test results obtained p value 0.002 <0.05. From 36 officers it was found that from 27 officers who worked at gas stations with risky working time as many as 21 people (58.3%) had normal sperm counts and 6 were abnormal (16.7%). From 9 officers who worked at gas stations with risky working time as many as 2 people (5.6%) the number of sperm was normal and 7 people were abnormal (19.4%). Chi-square statistical test results obtained p value 0.003 <0.05. The results of 36 male gas station staffers found that out of 15 officers working at gas stations with complete PPE use, 13 people (36.1%) had normal sperm counts and 2 people were abnormal (5.6%). From 21 officers who worked at gas stations with incomplete PPE usage as many as 10 people (27.8%) the number of sperm was normal and 11 people were abnormal (30.6%). Chi-square statistical test results obtained p value 0.016 <0.05.

4.0 Discussion

4.1 Relationship of Lead Levels in Ambient Air with Sperm Cell Counts in Male Gas Station Officers in Pematangsiantar City in 2019

Chi square test results showed that there was a significant relationship between lead levels in ambient air and the number of sperm cells in male gas station officials in Pematangsiantar City in 2019 with a value of $p = 0.007 < 0.05$. This is shown from the 36 number of gas station officials, 24 officers who worked at gas stations with low ambient air lead levels as much as 79.2 percent of their normal sperm count.

The results of the examination of lead levels in ambient air for three gas stations, there are two gas stations still below the specified threshold of $2 \mu\text{g} / \text{m}^3$ for the city of Pematangsiantar, this is caused by several factors, among others: the plant is located in the front around the gas station, with the presence of absorbent plants will reduce pollution caused by exhaust emissions from motor vehicles when refueling.

4.2 Relationship of Length of Work with the Number of Sperm Cells in Male Gas Station Officers in Pematangsiantar City in 2019

Chi square test results show that there is a significant relationship between the length of work and the number of sperm cells in male gas station officials in Pematangsiantar City in 2019 with a value of $p = 0.002 < 0.05$. This is indicated by the 36 officers, 25 gas station workers who worked at gas stations with a work duration of ≤ 3 years as much as 80.0 percent of their normal sperm count.

The results of the study can be seen that the longer working period has the potential to increase lead levels in urine. This is because lead has accumulative properties so that if a person is in an air condition that is polluted by lead the urine will contain lead which is inhaled as a respiratory activity. In other words, the longer the service station of a gas station employee, the higher risk of abnormal sperm counts.

4.3 Relationship between Work Time and Sperm Cells in Male Gas Station Officers in Pematangsiantar City in 2019

Chi square test results showed that there was a significant relationship between work time and sperm cell count in male gas station officials in Pematangsiantar City in 2019 with a value of $p = 0.003 < 0.05$. This is shown from the 36 number of gas station staff, 27 gas station staff working at gas stations with working time < 8 hours / day as much as 77.8 percent of the normal sperm count.

The results of the study can be seen that gas station employees who work on work shifts > 8 hours / day or usually workers who work > 8 hours / day are on the night shift, lead levels are higher than those on the work shift ≤ 8 hours / day or workers who work on the morning shift. The staff of SPBU administration told researchers that the number of liters of fuel that most consumers buy is in the afternoon until the evening, so workers who are on night shifts are more at risk than those on the morning shift. At night there is a buildup of carbon dioxide levels in the air, so that the lack of oxygen supply in the body and lead to lead to settle in the body in large amounts and does not react well in the body. At night too, the state of the body easily tired and weak makes the body feel tired from the activity at night. Weak body conditions coupled with a lack of nutritious intake into the body, will be easy for lead vapor to settle in the body in large amounts so that it affects the sperm count.

4.4 Relationship between the use of PPE and the number of sperm cells in male gas station officials in Pematangsiantar City in 2019

Chi square test results showed that there was a significant relationship between the use of PPE and sperm cell numbers in male gas station officials in Pematangsiantar City in 2019 with a value of $p = 0.016 < 0.05$. This is shown from the 36 number of SPBU officers, 15 SPBU officers using complete PPE as much as 86.7 percent of the normal sperm count.

The results of the study are known in carrying out daily tasks, almost all officers do not use personal protective equipment in the form of masks, this is due to lack of knowledge about the importance of personal protective equipment as well as gas station employees are not permitted to wear such masks due to regulations from Pertamina regarding "3S Program (Smiles, Greetings, Greetings) To Customers ". This program does not require them to wear personal protective equipment in the form of masks because if they wear it, then it looks rude to customers or fuel consumers. Another reason is that these employees are strictly prohibited from wearing masks when serving or not serving customers.

5.0 Conclusion and recommendation

Based on the research that has been done, it can be concluded that there is a significant relationship between lead levels, length of work, working time and sperm counts in male gas station workers in Pematangsiantar City in 2019.

The advice that the author can convey related to the results of this study is, the management of gas stations to be more disciplined in applying the rules of occupational health and safety in the work environment, especially related to the use of personal protective equipment such as masks, this is very important for the health and safety of workers . Gas station officials should consume foods containing vitamin E such as nuts to reduce the effects of lead in the body which can cause oxidative stress and the use of PPE during work must always be considered.

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