Exposure of Dust Inhaled with Lung Vital Capacity in Traffic Police Polres Ambon Moluccas

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Abstract. Traffic police is a profession that has a very high risk of being exposed to air dust and pollutants. This study aims to analyze the exposure of dust inhaled and the lung vital capacity of traffic police. The study design was observational analytic with a cross-sectional study with a sample of 58 traffic police. Data collection by interview, measurement of dust levels inhaled using Personal Dust Sampler (PDS) and measurement of vital lung capacity with a spirometer. The majority of respondents aged >30 years (70.7%), working period >5 years (63.8%), smoking habits (62.1%), ability to exercise (34.5%), and use personal protective equipment (masks) (39.7%). The measurement results of inhaled dust levels (62.1%) and the results of the measurement of the lung vital capacity of traffic police (77.6%) had pulmonary dysfunction. The results of the research related respirable dust exposure with lung vital capacity were respirable dust levels have no significant relation to the lung vital capacity traffic police p-value of 0.095 (p<0.05). This is possible because of influences from outside the workplace, habits, and lifestyle and does not use personal protective equipment (masks) when tasked with managing traffic.

1. Introduction

Improved transportation quality contributes greatly to the decline in air quality in urban areas [1]. One study reported that Indonesia is the country with the third highest level of air pollution in the world. About 70% causes of air pollution come from motor vehicle emissions. Motor vehicles accounted for almost 100% of lead (Pb), 71-89% hydrocarbon (HC) and 34-73% nitrogen oxide (Nox) to the air which are all parameters of air pollution based on ambient air quality standards according to Government Regulation No. 41 of 1999. Air contaminated with these substances can cause health problems mainly in physiological functions of body organs as one of them is lung [2]. Based on ILO data (International Labour Organization) that around 40,000 new cases pneumoconiosis (respiratory diseases) caused by workplace dust exposure that occurs throughout the world each year [3].

Work environment which is often full of dust, steam, gas and others which on the one hand disturbs productivity and disturbs health on the other hand, this often interferes with breathing or impaired lung function. Under certain conditions of dust, fumes, and gases are hazards that could...
interfere with the working comfort, impaired pulmonary function, it can even cause general poisoning [4].

Traffic police is a profession that has a very big risk to be exposed to pollutants originating from motor vehicle fumes. Disorders that are commonly known due to motor vehicle emissions are respiratory disorders, headaches, eye irritation, encourage asthma attacks, ISPA, impaired lung function and heart disease. Based on data obtained from the Medical Moluccas Police (Dokkes), in 2015 as many as 679 members in the ranks of the Molucca Regional Police suffered Acute Respiratory Infections. Data from the police who went to the hospital for ISPA sufferers in January was 13.10%, in February of 15.90%, March 41.38%, April 14.70%, Mei 14.87% [5]. Based on the description above, it is important to conduct a study regarding exposure to inhaled dust with vital lung capacity in the traffic police at Ambon Police Station.

2. Method
This type of research is quantitative by using a design cross-sectional. The sample in this study were all traffic police on duty in the road, 58 people, divided into 5 posts including: pos Mutiara, Alfatah post, Trikora, Mardika post and Karpan post. Measurement of vital lung capacity using a spirometer, while the measurement of respirable dust levels using Personal Dust Sampler. The results obtained were then analyzed using the SPSS program 16.0.

![Figure 1. Maps of research location](image)

3. Result and Discussion
The characteristics of traffic police consist of age, smoking habits, exercise habits, length of service and use of personal protective equipment. Traffic police aged ≤ 30 years were 17 people (29.3%) and those aged > 30 years were 41 people (70.7%). Traffic police who smoke as many as 36 people (62.1%) and who do not smoke as many as 22 people (37.9%). Traffic police who exercised as many as 20 people (34.5%) and who did not exercise as many as 38 people (65.5%). The traffic police who have ≤ 5 years 'work are 21 people (36.2%) and those who have> 5 years' work are 37 people (63.8%). Traffic police who used personal protective equipment (masks) were 23 people (39.7%) and who did not use personal protective equipment (masks) while serving on the road as many as 35 people (60.3%).
Traffic police characteristics are based on age (a), smoking habits (b), exercised (c), years of service (d) and use of personal protective equipment (e).

Traffic police with exposure to dust inhaled ≥ NAB as 36 people (62,1%) and exposure to inhaled dust < NAB as 22 people (47,9%). Traffic police with normal vital lung capacity of 13 people (22,4%) and 45 traffic police with lung vital capacity problems (77,6%).
Traffic police who have inhaled dust levels < NAB impaired lung vital capacity of 14 persons (63.6%) compared to 8 traffic police who did not experience lung vital capacity disturbances (36.4%). While the traffic police who have dust levels inhaled ≥ NAB, suffered vital lung capacity disorders of 31 people (86.1%), compared to 5 traffic police who did not experience lung vital capacity disturbances people (13.9%).

Chi-Square test results prove there is no significant relationship between the level of inhaled dust with vital lung capacity with p-value 0.095 (p < 0.05), RP value 0.382 and 95% CI (0.143-1.021) means that it cannot be concluded yet (in the population there is no difference) that the level of inhaled dust is a risk factor for impaired vital lung capacity in the police traffic.
According to WHO the size of dust particles that can harm the human body is in the range of 0.1-5 or 10 microns, whereas according to Departemen Kesehatan RI the size of dust that endangers humans ranges from 0.1-10 microns. Based on Permenakertrans RI No. 13 of 2011 concerning Threshold Limit Value of physical and chemical factors in the workplace that the maximum inhalation of dust particles in the workplace is 3mg/m³ [6].

Dust is often used as an indicator of pollution that is used to indicate the level of danger both in the environment and to work health and safety. The effect of dust on health depends on solubility, chemical composition, dust concentration, and particle size. Exposure to dust can cause restrictions on air flow (obstructive disease), bronchial wall thickening, increase mucous secretion, lowering the reflex refinement threshold and coughing, increase susceptibility to respiratory infections and asthmatic symptoms. In the pathogenesis the mechanism of lung capacity disruption is due to exposure to dust in the air, causing lung function to decline. Pulmonary function abnormalities is strongly influenced by the concentration of respirable dust where dust levels are joined absorbed into and retained in the alveoli, and then the dust on inhalation in the form of particles with a size of ≤5 microns [7].

The traffic police exposed to dust is not always impaired lung vital capacity, due to be caused by several factors, such as immune, the strength of the respondents in exhaling and the ability of the cilia in the filter dust into. Dust from vehicle traffic can affect lung function because it has a high level of toxicity. The effect of dust exposure that exceeds the threshold value can affect work comfort, and can cause various health problems such as respiratory problems such as coughing and shortness of breath, eye and skin irritation which will affect work productivity [8].

The results are consistent with the results of research conducted by Suprihatiningsih (2012) for workers at PT. Holcim showed no significant correlation between the levels of respirable dust with lung vital capacity with a p value = 1.000 [9], but this result is not in line with research conducted by Estevez et al (2013) on the traffic police in Bogota which showed a significant correlations between dust inhaled by the lung vital capacity with a p value = 0.01 [10].

4. Conclusion
Dust levels were inhaled at traffic police ≥ NAB 62.1% and < NAB 47.9%. Traffic police impaired lung vital capacity of as much as 77.6% and 22.4% are not impaired lung vital capacity. There is no significant relationship between the level of respirable dust with lung vital capacity of traffic police in Polres Ambon (p=0.095).

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