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ANALYSIS OF HEAT EXPOSURE PREVENTION ON STREET VENDORS WORKERS AROUND DIPONEGORO UNIVERSITY CAMPUS SEMARANG

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ABSTRACT

Background: *Climate change impacts on the increase in ambient temperature. This condition affects human health and environmental conditions. Street vendors have the risk of heat stress because of suffered direct sunlight. Efforts to prevent the effects of heat exposure in developing countries are not optimal. Semarang is residential with the hot climate. The aim of this study was to describe how street vendor prevent them from heat stress*

Method: *The research was a descriptive with a qualitative approach. Data obtained from an in-depth interview with 35 street vendors who work around Diponegoro University Campus. The in-depth questioner consists of how about their process of work, clothe, meal, beverage, and symptom of dehydration. The checklist was used to observed their clothe and shading. Data was analyzed with content analysis*

Results: *Street vendors work under the tree. They suffered heat stress from direct sunlight. They wear loose and clear color of clothing. They have a meal with boullion and much water. They use the tree for shading from direct sunlight. The symptom dehydration that appears was dry throat and feel fatigue. But their urine color was still clear. It's showed that dehydration has not suffered the street vendors*

Conclusion: *Street vendors have good behavior to prevent heat stress so they are not suffered dehydration*

Keywords: *Street vendor, Prevention, Heat Stress*

INTRODUCTION

Climate changes impact on the increase of ambient temperature. This condition affects human health and environmental conditions. Workers who work in a hot environment, climate change adds a burden to the workers at work. Heat stress increases the temperature of the environment increases, physical activity, physical differences in individual and no heat exposure prevention. Heat stress prevention technologies are not developed in developing countries [1]. Health problems caused by exposure to heat can be a mild form of the syndrome of muscle cramps, fainting, and exhaustion to heat stroke which can be life-threatening workers. Heat exhaustion due to the health disorders that often occur. Heat exhaustion is characterized by the reduction in body fluids and electrolytes due to sweating and not enough on replacing fluids[2]. Dehydration on workers started if the weight was down 1.5% at work [3]. Weight loss of 2% resulted in the emergence of a decrease in aerobic capacity, orthostatic tolerance and cognitive abilities [4]. Prevention of heat exposure can be done by applying heat exposure control hierarchy ranging from elimination, substitution, Engineering, Administration and Use of Personal Protective Equipment.

The preventive action to reduce effects of heat exposure through common techniques and special techniques. Common techniques include training to get adaptation to the environment and Heat stress Hygiene Practice (fluids and setting work hours). Special techniques include the hot prevention engineering controls, a decrease in workload, decrease in environmental temperature and humidity environment, the setting of clothes, a decrease in heat radiation, wind speed improvements and the use of ventilation [5]. Heat stress prevention have not been implemented properly in developing countries such as Indonesia [1]. The workers were not using PPE [6] Long exposure to heat and fatigue affect workers who working in the heat [7]. Carbohydrate electrolyte solution intake and short pauses prevent the dehydration and fatigue [8]. The impact of global warming also affects the temperature around UNDIP. The ambient temperature UNDIP Campus ranges from 31 to 32 degrees Celsius WBGT. This condition is a risk of thermal stress on workers. Street vendors are working with the potential hazards of heat exposure which can cause health problems. Health problems can be prevented by various means. The aim of this study described how street vendors prevent them from heat exposure.

METHODS

This study was a descriptive study using qualitative analysis., is a research method that puts the words as units of analysis, because the data it produces the form of words, phrases, and the narrative put forward by the study subjects. Conducted with the main objective to investigate, locate, describe, and explain a situation objectively. One issue that deserves to be studied with a descriptive method is to compare between one thing with another[9]. This study begins with observational studies, surveys followed by a qualitative study to gain a deeper understanding of the work performed street vendor.

In-depth interviews were conducted to 35 street vendors. Sampling technique used Saturated Sampling. The interviews included questions about cooking process, heat stress prevention: meal and beverage consumption, clothes and the shading street vendors wear and symptom of dehydration. The observation was done for equipment to reduce heat stress (kind and color of clothing, shading) with a checklist.

RESULTS

The condition of the work environment

The street vendors work around Diponegoro University Campus Semarang. They trade their food along Prof Soedarto street. The trees grow tall along that street. The ambient temperature was 30 degrees Celsius WBGT. This condition was higher than TEL/ NAB for work with the workload being for 8 hours. Characteristics of respondents mostly male sex. Body Mass Index of 60% of normal. All street vendors have been working in the environment longer than 2 weeks. Almost half of the street vendors work with the cooking process. They use the stove to cook the meal.

Heat stress prevention

Tabel 1. Observation of Shading to prevent from heat stress

No	Type of Shading	Yes f	%	No f	%
1	Under the tree	35	100	0	0
2	Umbrella	7	25	28	75
3	Hat	15	43	20	57

Street vendors use tree as shading. Only a few use umbrella and hat as Shaoxing

Tabel 2. Clothing characteristic to prevent from heat stress which street vendors wear

No	Clothing characteristic	Key answer
1	Type of Clothing	Jacket Clothing
2	Nature of clothe	Synthetic Cotton
3	Clothing color	Black Clear
4	Size	Fitt Loose

Street vendors wear clothes. Majority the wear cotton clothing. The color of the clothing were clear. They wear loose clothing.

Tabel 2. Consumption Meal and beverage

No	Meal consumption	Key answer
1	Type of beverage	Plain water Tea or coffee Electrolyte
2	Type of bouillon	Bouillon(Soup, Noodle) Without bouillon
3	Water intake	More than or eight cup (≥ 1600 cc) Less than eight cups(<1600 cc)

Majority of street vendors drink plain water. They consumed bouillon. They drink enough water

Tabel 4. Street Vendors Symptom of dehydration

No	Heat Stress Effect	Key answer
1	Lips	normal dry
2	Throat	dry normal
3	skin	normal dry
4	Thirsty	Thirsty NotThirsty
5	Feel of Fatigue	Fatigue Not fatigue
6	Urine color	Clear Concentrate

Almost all street vendor feel thirsty. Majority said they felt dry throat and feel fatigue. But according to their urine color, majority still clear color.

DISCUSSION

Street Vendors work under direct sunlight. Workers who work under direct sunlight are subjected to thermal stress, particularly during summer when the workplace conditions are hot and humid. The conditions are bad during summer because of thermal stress[10]. Street vendors are at the risk of heat stress. One of the important reasons of the increased heat load in the workplace is direct sunlight. Another reason would be the location of the activity as the majority of waste site activity

workers worked in urban parks and green spaces in warm hours[11]. Many street vendors cook the meal with a stove. The furnace will increase the hot climate[12].

According table 2, Majority of the street vendors wear loose and cotton clothing. Loose clothing will increase the passage of water vapor and thus increases body heat loss by evaporative cooling. It's called Chimney effect. Loosely hanging clothing ventilates the trapped air layers from the body. Cotton will absorb the sweat and increase water evaporation[13]. The usual clothing for people who work on hot climate was cotton trousers and long sleeved shirts. The thermal characteristics of these clothes have been previously measured and were entered into the air cooling power calculations[14]. The 'clo' unit is an index clothing thermal resistance. One clo represents the clothing necessary to allow a resting individual to be in a comfortable state when the ambient temperature is 21°C[13]. The majority of the street vendors did not wear the jacket. Jacket blocked the body heat release. The jacket will increase temperature, and adds heat load for street vendors. Proper clothing can help to minimize the effects of poor environmental conditions. Light-color, loose-fitting, open-weave clothes allow maximum heat deflection and optimal evaporation[15]. Wearing lighter and more breathable clothing can help reduce the impacts of extreme heat because it allows the body's natural cooling systems to function better[16]

According table 3, Majority of street vendors drink plain water. They drink water more than 1600 ml/day . Some references say water intake can prevent dehydration[17]. The kinds of fluids consumed are also relevant. They consumed bouillon from noodle and soup. Mineral drinks (including bouillon) are recommended. Few street vendors drink tea or coffee. Excessive consumption of coffee should be avoided, especially during periods of dehydration as these drinks actually dehydrate rather than hydrate. Water and mineral drinks (including clear soup) should also be made available and easily accessible[18]. Liquid containing electrolyte and carbohydrate would more quickly restore fluids lost due to heat exposure[17].

According table 1, All of the respondents worked under the tree. They said that tree would protect them from sunlight. Tree protect from heat by reducing energy radiation and absorb the reflective radiation from the environment around the workplace. The impact of green space in cities is adjusting temperature, increasing the relative humidity, air freshness and absorbing the dust[11]. A quarter of them used the umbrella to protect them from solar radiation. Almost half of them wear the hat to protect their head from solar radiation. Shading is one of the first steps that should be taken to moderate the stressful effects of a hot climate. It is to protect the street vendors from direct and indirect solar radiation. It was estimated that total heat load could be reduced from 30 to 50% with a well-designed shade, and shading is one of the more easily implemented and economical methods to minimize heat from solar radiation[19]. The vegetation of urban areas decreases hot climate because of the shade increase the absorptive surface to the suns. It also increases the potential for evaporative cooling heating[20].

All of the prevention by the street vendors reduce dehydration. The majority of respondents have clear color urine. It showed that they were not suffered dehydration. Although majority only feel thirsty and have the dry throat, exposure to heat can be risky to health and safety street vendors[21]. Heat stress causes health risks, a decrease in worker productivity, increased irritability, increased risk of accidental injury in workplaces, and when severe heat stroke and death, negatively impacting family income and the community economy[11].

The limitation of this study was there is no measurement in the sign of dehydration(Body weight and urine density). Reduces in body weight and urine density showed the dehydration process.

CONCLUSION

Street Vendors have good behavior in prevent from heat stress. They wear loose and clear color of clothe. They have meal with boullion and much water. They trade under the tree. So they were not suffer dehydration.

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