

Relationship Between Individual Characteristics and the Risk of Exposure to Heat Stress in Indonesian Fishermen

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ABSTRACT

Background: Fishermen who go to sea during the day are classified as informal sector jobs that have heavy activities and are at risk of becoming dehydrated because the work climate is in a hot environment due to exposure to sunlight. **Objective:** The purpose of this study was to analyze the relationship between individual characteristics and the risk of heat stress exposure to fishermen in Surabaya Coastal Area. **Materials and Methods:** This research is a cross sectional study with a sample of 100 people using accidental sampling technique. The research was conducted in the Surabaya Coastal Area from February to June 2022. The variables of this study include age, exercise habits, water drinking consumption, and risk of heat stress. The relationship analysis test used Spearman correlation and chi square. **Results:** Based on cross tabulation, the age interval that experienced the most heat stress was 41-50 years of age, followed by 51-60 years of age group. Respondents who exercise more are at risk of heat stress than respondents who do not exercise. Workers who consume 1-2 liters of water per day are the group that has the highest risk of heat stress. **Conclusion:** No one variable has a relationship with the risk of heat stress exposure to fishermen in Surabaya, but it is still important to increase the consumption of fisherman's water and doing exercise habits among fishermen in Surabaya. **Key words:** Age, Exercise Habits, Heat Stress, Water Drinking Consumption.

INTRODUCTION

To better understand the impact of climate change on health and work productivity, it is critically important to conduct a work environment assessment to identify the occupational settings and working populations that are most vulnerable to rising global temperatures. Fishermen who go to sea during the day are classified as informal sector jobs that have heavy activities and are at risk of becoming dehydrated because the work climate is in a hot environment due to exposure to sunlight. Exposure to excessive heat stress in the workplace can cause dyslipidemia, cardiovascular disease, digestion, and death.

A total of 1,827,218 fishermen in Indonesia with a total of 162,827 in East Java.¹ Working conditions that are exposed to heat from the sun directly have a risk that fishermen will be exposed to heat stress that can interfere with their health, such as high blood pressure and kidney disease. Heat stress is a physical hazard and a potential health risk which can result in various conditions ranging from discomfort, headaches, psychological disorders, heat stroke and even death in extreme cases. Heat stress can affect the health and productivity of workers.² Research in India showed that out of 442 workers, 71% of workers worked in places which were exposed to heat, either from the sun's heat or incineration or other heat processes. For workers who worked in the summer, 82% of workers experienced heat stress. For workers who worked in colder seasons, 42% of workers experienced heat stress. The purpose of this study was to analyze the relationship between individual characteristics and the risk of heat stress exposure to fishermen in Surabaya Coastal Area.

MATERIALS AND METHODS

Materials

This study is quantitative research with observational research type. It is a cross-sectional study. The research was conducted from February to June 2022 which was located in the coastal area of Surabaya City. The variables of this study include age, exercise habits, water drinking consumption, and risk of heat stress.

Methods

Population in this study were all fishermen in coastal areas in Surabaya. By using accidental sampling technique, 100 respondents were obtained.

We conducted interviews with a questionnaire guide because not all fishermen could read and write. Interviews were conducted by one person who had been trained by researchers so as to minimize bias. We tested the validity and reliability before this research was conducted on 15 respondents. The results showed that all questionnaires were valid and reliable.

Ethical clearance

This study has obtained Ethical Clearance No. 77/EA/KEPK/2022 from Health Research Ethics Committee, Faculty of Public Health, Universitas Airlangga.

Data analysis

Data analysis was performed using data processing software. The relationship analysis test of age and water drinking consumption variables used

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Spearman correlation and the relationship analysis test of exercise habits variables used chi square.

RESULTS

Relationship between age and risk of heat stress

Based on the cross tabulation between age and risk of heat stress in table 1, the age interval that experienced the most heat stress was 10-30 years of age. However, based on the Spearman rank test, a p-value of 0.427 was obtained, which means that the relationship between age and the risk of heat stress was not significant (> 0.05).

Relationship between exercise habits and risk of heat stress

Based on the cross tabulation between exercise and the risk of heat stress in table 2, respondents who exercise more are at risk of heat stress than respondents who do not exercise. However, based on the chi-square test, exercise and the risk of heat stress did not have a significant relationship, because the p-value obtained was 0.755 (> 0.05).

Relationship between drinking water consumption and risk of heat stress

Based on the cross tabulation of water consumption with the risk of heat stress in table 3, workers who consume <1 liters of water per day are the group that has the highest risk of heat stress. Based on the Spearman rank test, the relationship between water consumption and the risk of heat stress is not significant because the p-value obtained is 0.334 (> 0.05).

DISCUSSION

Relationship between age and risk of heat stress

Most of the fishermen are in the age interval of 41-50 years. However, there are some respondents who are >60 years old. Older workers experience a decreased physiological ability to remove heat from the body,³ so that when exposed to heat they have little ability to dissipate

Table 1: Cross tabulation of age with risk of heat stress (N=100).

Age	No Risk of Heat Stress	Risk of Heat Stress	Total	p-value
10-20	0	5	5	0.427 (Spearman)
21-30	0	7	7	
31-40	10	13	23	
41-50	5	20	25	
51-60	6	17	23	
>60	6	11	17	

Table 2: Cross tabulation of exercise habits and risk of heat stress (N=100).

Exercise Habits	No Risk of Heat Stress	Risk of Heat Stress	Total	p-value
No	12	35	47	0.755
Yes	15	38	53	(Chi-square)

Table 3: Cross tabulation of drinking water consumption and risk of heat stress (N=100).

Drinking Water Consumption	No Risk of Heat Stress	Risk of Heat Stress	Total	p-value
<1 liter	0	6	6	0,334 (Rank-Spearman)
1-2 liter	17	44	61	
$>2-3$ liter	8	19	27	
>3 liter	2	4	6	

heat.⁴ In addition, the bodies of older workers are slower to adapt to hot environments.⁵ Based on a study, workers aged 31-70 years should be screened before working in a hot environment to reduce the risk due to heat exposure.⁶

There is no significant relationship between age and the risk of heat stress in fishermen at the Fisherman in Surabaya. The results of this study are different from studies conducted in several tofu factories in Indonesia which showed that there was a relationship between age and symptoms of heat strain in workers.⁷ However, the results of this study are in line with a review article which states that age only has a very small independent influence on the incidence of heat stress.⁸

Relationship between exercise habits and risk of heat stress

The majority of fishermen in this study have their daily exercise habits. Regular exercise can improve body fitness and vitality. In addition, exercise also functions to improve one's brain ability, because when exercising, blood circulation that carries oxygen to the brain can run well.⁹ In addition, regular exercise can also maintain and improve the body's functional abilities.¹⁰

Exercise habits in this study did not have a significant relationship with heat stress. Research related to the relationship or influence between exercise habits and the risk of heat stress is still rarely found. However, an article reported the occurrence of death in someone who did physical activity in hot temperatures due to failure to adjust body temperature to environmental temperature.¹¹ This is in line with the results of research showing that exercising in a hot environment can have a fatal impact to death.¹²

Relationship between drinking water consumption and risk of heat stress

The majority of fishermen consume water in the amount of 1-2 liters per day. However, there are some respondents who consume <1 liter of water per day. NIOSH recommends workers who work in hot environments to consume 1 glass of water every 15-20 minutes,¹³ so the total water consumption of respondents in this study is still below the NIOSH recommendation.

Workers who consume <1 liter of water per day are all at risk of heat stress. Water consumption in this study did not have a significant relationship with the risk of heat stress. This is in line with the results of research in the city of Semarang which showed that there was no relationship between the amount of water consumed and the effects of heat stress.¹⁴ Another study conducted in Tegal also showed that there was no relationship between drinking water consumption and heat strain.¹⁵ However, other studies conducted in plastic and textile factories showed a relationship between the hydration status of workers and heat stress.¹⁶ Thus, it is still important to increase the consumption of fisherman's water.

CONCLUSION

Age, exercise habits and water drinking consumption has no relationship with the risk of heat stress exposure to fishermen in Surabaya, but it is still important to increase the consumption of fisherman's water and doing exercise habits among fishermen in Surabaya.

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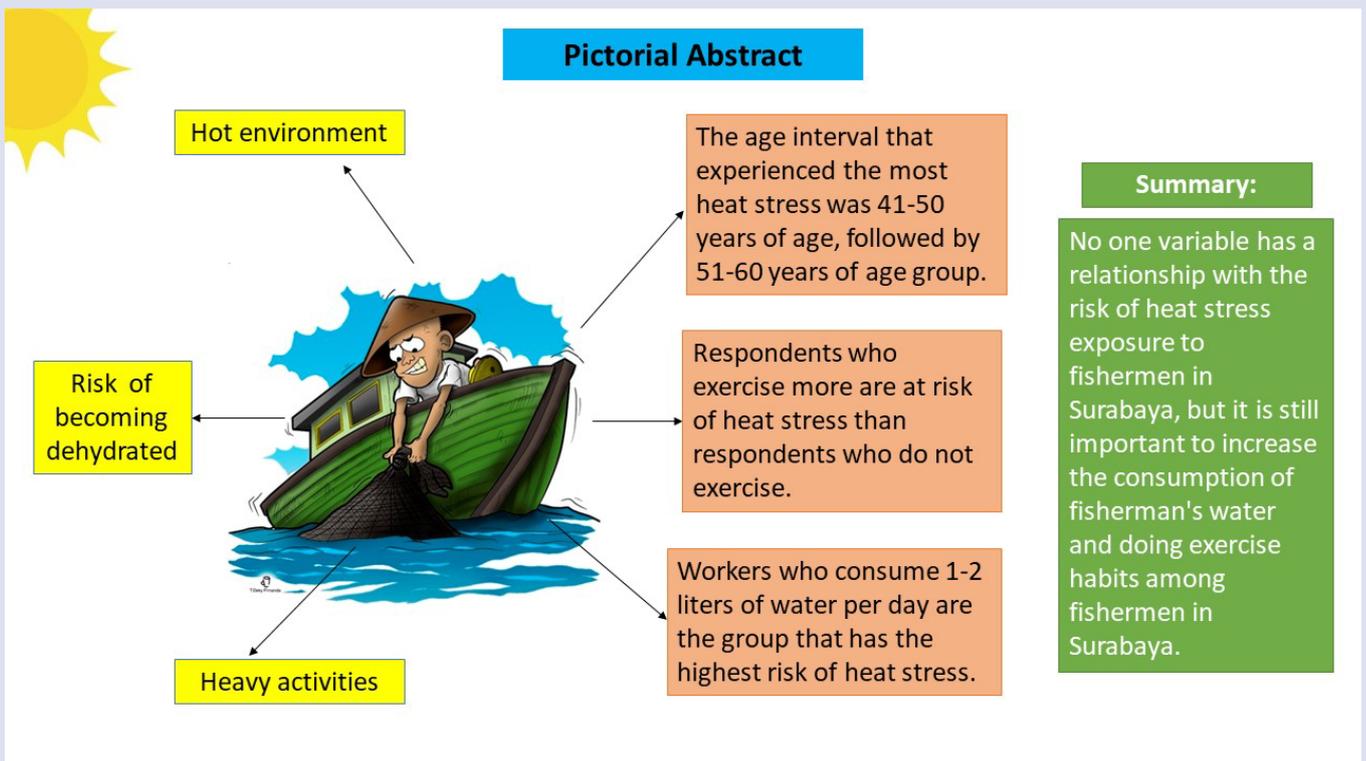
CONFLICTS OF INTEREST

The authors have no conflicts of interest.

REFERENCES

- Central Bureau of Statistics of East Java Province. Number of Capture Fisheries Households by Regency/City and Subsector in East Java Province, 2017. 2019. Available from: <https://jatim.bps.go.id/statictable/2019/10/14/1878/jumlah-rumah-tangga-perikanan-tangkap-menurut-kabupaten-kota-dan-subsektor-di-provinsi-jawa-timur-2017.html>
- Venugopal V, Latha PK, Shanmugam R, Krishnamoorthy M, Johnson P. Occupational heat stress induced health impacts: A cross-sectional study from South Indian working population. *Adv Clim Change Res.* 2020;11(1):31-9.
- Balmain BN, Sabapathy S, Louis M, Morris NR. Aging and Thermoregulatory Control: The Clinical Implications of Exercising under Heat Stress in Older Individuals. *BioMed Res Int.* 2018;2018:8306154.
- Malmquist A, Hjerpe M, Glaas E, Karlsson H, Lassi T. Elderly People's Perceptions of Heat Stress and Adaptation to Heat: An Interview Study. *Int J Environ Res Public Health.* 2022;19(7):3775.
- Centers for Disease Control and Prevention. Heat and Older Adults. 2017. Available from: <https://www.cdc.gov/disasters/extremeheat/older-adults-heat.html>
- Flouris AD, Mcginn R, Poirier MP, Louie JC, Ioannou LG. Screening criteria for increased susceptibility to heat stress during work or leisure in hot environments in healthy individuals aged 31-70 years. *Temperature.* 2018;5(1):86-99.
- Zulhanda D, Lestari M, Andarini D, Novrikasari. Symptoms of Heat Strain in Tofu Makers in the Cambodian Region of Palembang City. *J Kesehat Lingkung Indones.* 2021;20(2).
- Foster J, Hodder SG, Lloyd AB, Havenith G. Individual Responses to Heat Stress: Implications for Hyperthermia and Physical Work Capacity. *Front Physiol.* 2020;11(3):541483.
- Ridwan M. Recognizing, Preventing, and Overcoming Silent Killers, "Parkinson." Yogyakarta: Hikam Pustaka; 2017.
- Sobarna A, Hamidi A, Rizal M. *Sports Sociology.* Serang: Desanta Publisher; 2021.
- Yofrido FM, Setiawan P. Exertional heatstroke, asesmen cepat dan penatalaksanaan. 2019;74-90.
- Ashadi K. Sports Activities in Hot Environments. *Pros Semin Nas Prodi Biol FMIPA UNHI.* 2014;294-7.
- National Institute for Occupational Safety and Health. Heat Stress-Hydration. 2017 [cited 2022 Jun 1]. Available from: <https://www.cdc.gov/niosh/mining/UserFiles/works/pdfs/2017-126.pdf>
- Budhiasih RT, Widjasena B, Jayanti S. Correlation between Acclimatization Status and Effects of Heat Stress on Street Vendors in Front of Polines (Politeknik Negeri Semarang). *J Kesehat Masy Undip.* 2017;3(3):605-15.
- Nofianti DW, Koesyanto H. Years of Service, Workload, Drinking Water Consumption and Health Status with Heat Strain in Work Area Workers. *Higeia J Public Health Res Dev.* 2019;3(4):524-33.
- Prayitno DA, Rachmawati S, Widjanarti MP, Hawali H, Matin A. Correlation of Heat Stress to Hydration Status of Workers at Weaving Section of Textile Industries. 2020;8(2):8-11.

GRAPHICAL ABSTRACT



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