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The Impact of Hydration Level on Groundhandling Officer at Bandara Soekarno Hatta

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ABSTRAK

Background: Groundhandling workers are workers who are exposed to heat for quite a long time. A work environment that exceeds tolerance limits can cause health problems such as dehydration and fatigue. Lestari (2016) in his research stated that a hot work environment that exceeds the Threshold Limit Value (TLV) can increase the risk of dehydration.
Purpose: This research focuses on fatigue and the risk factors of fatigue, especially those caused by dehydration, without disregarding other risk factors among ground handling workers at Soekarno-Hatta Airport.
Method: The method used in this research is an observational analytic approach with a cross-sectional design. The sampling technique employed random sampling with a sample size of 219 respondents consisting of ground handling workers working both inside buildings and on the apron. The measuring instruments used were specific gravity urine tests to determine hydration status and IFRC questionnaires to assess workers' physical fatigue status.
Result: From the existing data it was found that the majority of respondenst experienced mild fatigue, namely 36,5% of the 219 respondents and others experienced severe fatigue 63,5%. With hydration status, most workers have good hydration status (euhydration), namely 70,3% and and some others experienced dehydration, namely 29,7%. The result of the analysis between hydration status and level fatigue showed 35,4% of respondents who werw dehydrated experienced severe fatigue, while 37% of respondents who were euhydrated/normohydrated experirienced severe fatgue. The results of the analysis test obtained was no relationship between hydratin status and fatigue level. The OR (Odd Ratio) shows a result or 0,932 meaning that respondents withs dehyration are protective factor of 0,93 times agains severe fatigue.
Conclusion: The conclusion of this research is that good hydraton status can prevent fatigue in workers, especially those who work with direct heat exposure.

Keywords: Dehydration; Fatigue; Groundhandling

INTRODUCTION

Work fatigue or fatigue is one of the main risks that cause accidents in Indonesia. According to the results of a national safety study by Better Up, about 96% of workers experience work fatigue. Work fatigue is a major risk factor contributing to workplace accidents (1). Another study showed that of 606 construction worker respondents over the past three months, 49% felt fatigued for several days, and 10% felt fatigued every day (2). A study in a construction site in Semarang involving 35 construction workers found that 100% of them experienced fatigue after work, with 11.43% experiencing mild fatigue, 42.86% moderate fatigue, and 45.7% severe fatigue (3). The working climate is one of the factors that can cause health problems and disorders for workers, comprising the combination of working temperature, air humidity, air velocity, and radiation temperature in the workplace (4). Extreme heat can lead to increased sweat production and blood flow to the skin, which can increase the risk of dehydration and fatigue.

Several studies indicate that workers who are not well-hydrated are susceptible to heat fatigue and are at risk of serious physical injuries such as heat stroke (5). Another study found a correlation between working climate conditions and fatigue (p=0.023) and the impact of working climate on dehydration (p=0.000) (6). Lestari (2016), in her research, stated that there is a significant difference in the levels of fatigue and dehydration between working climates exceeding the Threshold Limit Value (TLV) and those below the TLV, with results of (p=0.002) and (p=0.0021), respectively (7).

PT. XYZ is a company that offers a variety of airport operational support services. The company provides various types of services including: Administration and supervision; Passenger services; Runway services; Load control; Communication and flight operations; Cargo and mail services; Support services; Security and Aircraft Maintenance. Ground handling workers are one of the populations at risk of experiencing fatigue. During the landing and take-off process of an aircraft, it is supported by many workers, including ground handling workers who are responsible for preparing the aircraft, serving passengers, cargo services both inside the terminal and on the apron.

Based on an initial survey conducted on 20 ground handling workers, it was found that 10% of the workers experienced high fatigue and 20% experienced moderate fatigue. Consider to the correlation between heat exposure, hydration levels, and the risk of fatigue in workers, an additional study was conducted with the aim of analyzing the level of fatigue caused by dehydration without disregarding other risk factors.

METHOD

This research was conducted using an observational method with a cross-sectional quantitative design approach. The research took place at Soekarno-Hatta Airport from September 2023 to March 2024, with the population of this study being the ground handling workers of PT. XYZ. Samples were taken using random sampling, with a total sample size of 219 workers, both those working inside the terminal building and those working outside (on the apron). This study carefully adhered to the principles of health research ethics, and all respondents willingly participated in the study.

The dependent variable in this study is work fatigue, with the independent variable focused on hydration status without disregarding other variables as risk factors. ata collection techniques involved direct examination and questionnaire completion using a standardized questionnaire instrument from IFRC. Workers who completed the questionnaire underwent health examinations, including blood pressure, pulse, and body temperature measurements as indicators of workers' health status, and specific gravity urine tests to determine workers' hydration status. Additionally, examinations were conducted using a Kestrel® Environmental Meter to measure the Wet Bulb Globe Temperature (WBGT) index, which assesses working climate and comprises dry bulb temperature, wet bulb temperature, and globe temperature. Data were analyzed descriptively, followed by hypothesis testing to obtain p-values and odds ratios.

RESULT

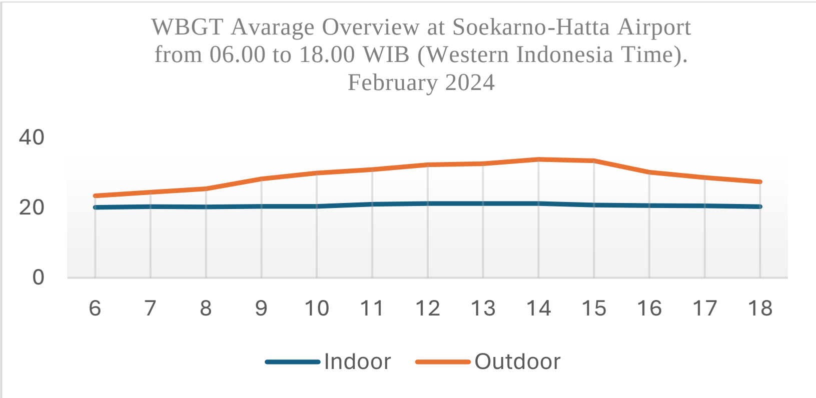
The univariate analysis results revealed descriptions of work fatigue, hydration status, and other related and unrelated risk factors. The descriptive analysis of the data is presented in Table 1. Most respondents experienced mild fatigue, with 63.5% out of 129 respondents, while the remaining 36.5% experienced severe fatigue.

Tabel 1. The distribution of Work Fatigue, Hydration Status, Work-Related Risk Factors, and Non-Work-Related Risk Factors.

Variable	Frequency	Presentase (%)
Dependent Variable		
Work Fatigue		
Severe Work Fatigue	80	36,5
Mild Work Fatigue	139	63,5
Main Independent Variable		

Hydration Status		
Dehydration	65	29,7
Euhydration	154	70,3
Work-Related Risk Factors		
Work Duration		
>8 hours	93	42,5
≤8 hours	126	57,5
Work Load		
Severe	96	43,8
Mild	123	56,2
Work Environment		
Outdoor	136	62,1
Indoor	83	37,9
Sleep Duration		
Sleepless (≤ 7 jam)	123	56,2
Enough Sleep (> 7 jam)	96	43,8
Work-Nonrelated Risk Factors		
Gender		
Female	42	19,2
Male	177	80,8
Age	79	36,1
≥40 Years Old	140	63,9
<40 Years Old		
IMT		
Obesity	129	58,9
Non Obesity	90	41,1
Body Temperature (ºC)		
>37	79	36,1
36-37	140	63,9

In this study, workplace climate assessments were conducted based on the different work areas at Soekarno-Hatta Airport, namely indoor and outdoor areas. Measurements in the outdoor area were conducted on February 12-14, 2024, while measurements in the indoor area were conducted on February 18-20, 2024. A comparison of the average results of workplace climate measurements can be seen in the figure below:



From the above figure, it can be observed that the workplace climate in the indoor area remained stable during the 12-hour measurement period, unlike the outdoor area where an increase occurred, particularly at 14:00 and 15:00 (WIB). The outdoor measurements showed an average of 29.3°C, while the indoor measurements showed an average of 20.6°C. This indicates that respondents working in outdoor areas are at risk of dehydration due to the workplace climate. Continuous neglect of changes in hydration status can lead to health problems, especially disturbances in the secretion or circulatory system, resulting in decreased productivity and increased risk of fatigue.

Table 2. Results of the Bivariate Analysis show the relationship between the risk factors and work fatigue

Variable	Work Fatigue				p-value	cOR (95% CI)
	Severe		Mild			
	n	%	n	%		

Independent Variable						
Hydration Status						
Dehydration	23	35,4	42	64,6	0,940	1,93 (0,51 – 1,71)
Euhydration	57	37	97	63		
Work-Related Risk Factors						
Work Load						
Severe	31	32,3	65	67,7	0,313	0,72 (0,41 – 1,26)
Mild	49	33,1	83	66,9		
Work Environment						
Outdoor	50	36,8	86	63,2		1,03 (0,58 – 1,81)
Indoor	30	36,1	53	63,9	1	
Sleep Duration						
Sleepless (≤ 7 hours)	53	43,1	70	56,9	**0,03***	1,93 (1,09 – 3,42)
Enough Sleep (>7 hours)	27	28,1	69	71,9		
Gender						
Female	21	50	21	50	0,06	2 (1,01 – 3,9)
Male	59	33,3	118	66,7		
Body Mass Index (BMI)						
Obesity	50	38,8	79	61,2	0,498	1,27 (0,71 - 2,22)
Non Obesity	30	33,3	60	66,7		
Body Temperature						
>37ºC	31	39,2	48	60,8	0,631	1,1 (0,51 - 2,31)
36 – 37 ºC	49	35	91	65		

The analysis results in Table 2 show that 35.4% of dehydrated respondents experienced severe fatigue, while 37% of respondents with euhydration/normohydration experienced severe fatigue. The bivariate analysis yielded a p-value of 0.940, indicating no significant relationship between hydration status and fatigue (p-value > 0.05), with the cOR value suggesting dehydration as a protective factor against fatigue. This contradicts existing literature (8), prompting the researcher to proceed with an interaction test between the main independent variable and other independent variables to observe which variables interact with hydration status. Additionally, regression analysis was conducted to obtain adjusted Odds Ratios (aOR) (9). The variables showing a significant relationship with fatigue based on the bivariate analysis were sleep duration (p-value < 0.025) with an OR value of 1.93, indicating a 1.93-fold increased risk of fatigue with insufficient sleep compared to sufficient sleep. However, for workload, working climate, gender, BMI, and body temperature, bivariate analysis showed no significant relationship with fatigue. All independent variables underwent multivariate analysis disregarding existing p-values because all variables were considered to have a relationship with fatigue.

Tabel 3. Final Model Multivariate Analysis

Variable	*p-value*	aOR	95% CI		B	SE
			Lower	Upper		
Hydration Status Dehydration Euhydration	0,340	1,560	0,626	3,888	0,428	0,465
Work Load Severe Mild	0,443	0,752	0,363	1,557	-0,058	0,314
Work Environment Oudoor Indoor	0,251	1,605	0,715	3,603	0,634	0,398
Sleep Duration Sleepless (≤ 7 hours) Enough Sleep (>7 hours)	**0,037***	1,905	1,039	3,493	0,618	0,307
Gender Female Male	**0,043***	2,344	1,028	5,343	0,671	0,385

Body Mass Index (BMI) obesity Non Obesity	**0,014***	5,052	1,394	18,308	1,648	0,656
Body Temperature >37 ºC 36 – 37ºC	0,445	1,334	0,637	2,794	0,318	0,376
Hydration Status by BMI	**0,022***	1,184	0,043	0,787	-1,699	0,740

From Table 5.15, it is explained that there is an interaction between hydration status and BMI (Body Mass Index) regarding the level of work fatigue. This indicates that the influence of hydration status on the level of work fatigue varies or depends on BMI status. Therefore, it is known that the OR value for overweight BMI (code 0) concerning the level of fatigue is = e^(1.648+((-1.699) * BMI)) = e^(1.648+((-1.699) * 0)) = e^(1.648) = 5.20. This means that respondents who are obese, with dehydration status, are at a 5.20 times higher risk of experiencing severe fatigue compared to euhydration status after controlling for work-related risk factors and non-work-related risk factors. Meanwhile, the OR value for non-obese BMI (code 1) concerning the level of fatigue is = e^(1.648+((-1.699) * BMI)) = e^(1.648+((-1.699) * 1)) = e^(-0.051) = 0.95. This means that non-obese respondents with dehydration status are at a 0.95 times lower risk of experiencing severe fatigue compared to euhydration status after controlling for work-related risk factors and non-work-related risk factors. From the interaction results, it is known that the influence of hydration status on the level of severe fatigue will be greater for respondents who are obese.

For the confounding variables known to have a significant relationship with the level of fatigue, namely sleep duration, gender, and BMI (p-value < 0.05), the analysis resulted in adjusted Odds Ratios (aOR). The adjusted Odds Ratio (aOR) for the variable Sleepless (≤ 7 hours) was found to be 1.91 (95% CI; 1.04-3.49). This means that respondents with sleep duration less than or equal to 7 hours are 1.91 times more likely to experience severe fatigue compared to those with enough sleep duration (> 7 hours) after controlling for work-related risk factors and non-work-related risk factors. The analysis yielded an adjusted Odds Ratio (aOR) of 2.34 (95% CI; 1.03 – 5.34) for the variable "gender". This indicates that females are 2.34 times more likely to experience fatigue compared to males after controlling for work-related risk factors and non-work-related risk factors. Furthermore, the analysis of the BMI variable resulted in an aOR of 5.052, indicating that obesity carries a 5.052 times greater risk of fatigue compared to non-obesity after controlling for work-related risk factors and work-nonrelated risk factors.

DISCUSSION

Based on the research results, it was found that most of respondents had normal specific gravity urine test results, indicating that 70.3% of them had good hydration status or euhydration. Meanwhile, the remaining 29.7% experienced dehydration, either mild or moderate.

The bivariate analysis results indicate that there is no significant relationship between hydration status and the occurrence of severe fatigue in respondents. This contrasts with the findings of Lestari's study (2016), which showed a significant relationship between dehydration and fatigue. Based on existing literature (8) and (10), dehydration is not considered a risk factor for fatigue, whether work-related or non-work-related. Dehydration is one of the indirect risk factors resulting from the work environment, particularly from excessive heat exposure, whether directly from the sun, the working environment, or the equipment used.

The multivariate analysis results show that there is no significant relationship between hydration status and the level of fatigue in respondents (p-value >0.05) with an OR value of 1.56. This means that dehydration increases the risk of fatigue by 1.56 times in respondents. Additionally, an interaction test was conducted between hydration status and other fatigue risk factors, revealing an interaction between hydration status and BMI. This implies that changes in hydration status are influenced by an individual's BMI status. The OR value for BMI with obesity (code 0) indicates that dehydration with obesity has a risk more than 5.20 times higher of experiencing severe fatigue compared to euhydration after controlling for work-related risk factors and non-work-related risk factors. The OR value for BMI with non-obesity indicates that dehydration has a 0.95 times lower risk of experiencing severe fatigue compared to euhydration after controlling for work-related risk factors and non-work-related risk factors. According to Chang et al. (2016), the body with more muscle tissue contains more water, so individuals with overweight require more fluid intake (11). Additionally, Riley and McPherson (2017) state that an increase in specific gravity urine is an indication of health issues, where existing health problems have the potential to affect work productivity and increase the risk of fatigue (12).

CONCLUSION

The proportion of workers experiencing severe fatigue is 36.5%. There is no significant relationship between hydration status and severe fatigue among ground handling workers at Soekarno-Hatta Airport, with the adjusted

Odds Ratio (aOR) indicating dehydration as a risk factor for severe fatigue. However, there is a significant relationship between sleep duration, gender, and Body Mass Index (BMI) with severe fatigue among ground handling workers at Soekarno-Hatta Airport. The interaction test results indicate an interaction between hydration status and BMI. Hydration status is indeed one of the risk factors for fatigue among workers, although it is not consistently included as a risk factor in some literature, whether related to work or not. Dehydration is a consequence of working in excessively hot climates or above the Threshold Limit Value (TLV). If ignored, dehydration can lead to health problems and occupational diseases.

SUGGESTION

Health promotion related to hydration status and its impact on workers' health, providing easily accessible drinking water filling facilities for employees, socialization for self-checking of hydration status using urine color indications, and conducting regular subjective and objective fatigue assessments can be done.

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