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RELATIONSHIP OF HYDRATION STATUS WITH THE CONCENTRATION LEVEL OF RUBBER FARMERS IN TRIKORA SOUTH LAMPUNG

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ABSTRACT

Hydration status is a person's body condition that describes the amount of water in the body. Poor hydration status can affect decision-making and cognitive performance in the form of concentration levels, leading to lower productivity and increasing the risk of work-related accident. The objective of this study was to determine the hydration status and its relationship with the concentration level of rubber farmers in South Lampung. this research was an observational study with a cross-sectional design. The population in this study was 80 rubber farmers in South Lampung. The sampling method used was concecutive sampling with inclusion and exclusion criteria and obtained a sample of 67 respondents. The independent variable in this study was hydration status and the dependent variable was the concentration level. Data were analyzed using a Chi-square test with α value of 5%. Statistical analysis showed that 37 respondents (55.2%) were dehydrated and 36 respondents (53.7%) had a low concentration level. The results of bivariate analysis between hydration status and concentration level showed the p-value = 0.012. There was a significant relationship between hydration status and concentration level in rubber farmers in South Lampung. It is very important to educate the farmers about healthy hydration to help them having a good concentration level at work.

Keywords: concentration level, hydration status, rubber farmer.

1. INTRODUCTION

Water has a very important role and is one of the main components in the human body, which accounts for about 60%–70% of the total body weight, and the brain contains 85% water. Impaired brain performance can be caused by small changes in fluid balance in the brain. Changes in the fluid osmolality of the central nervous system cause a decrease in neuronal fuel, which then causes membrane hyperpolarization, which can cause disturbances to get cognitive function in the form of good attention.[1]

The balance between the water output and the water input determines the hydration status. Excessive water loss or insufficient water intake leads to dehydration. Dehydration is a condition of imbalance in body fluids because fluid expenditure is greater than the intake. Dehydration is caused due to hot weather, consumption of diuretic drugs, and lack of fluid consumption[2,3] .

Dehydration can lead to a decline in cognitive ability due to difficulty concentrating, an increase in risk of urinary tract infections, and also the formation of kidney stones. Consuming sufficient amount of fluids gives benefit in preventing urinary tract infections, work fatigue, and low concentration, headaches, lethargy, seizures to fainting.[4]

The results of The Indonesian Hydration Study (THIRST) (2009) showed that as many as 46.1% of the 1,200 people

in Indonesia in DKI Jakarta, West Java, East Java, and South Sulawesi, experienced mild dehydration. This result showed that almost half of the population of Indonesia experiences mild symptoms of dehydration.[5]

The hydration status of workers can be influenced by several things such as the worker's knowledge of the importance of fluid consumption for body health, history of diseases such as diabetes mellitus, and also the drugs consumed. A hot working environment can disrupt body fluid balance if the heat received from the environment is greater than that dissipated. When the body temperature rises above 37°C, the body tries to control the heating mechanism by pumping more blood through the heart, the peripheral blood vessels dilate, so that more of blood will flow to the surface of the skin, as the body tries to release heat.[6]

Loss of concentration when doing work activities can result in a huge impact in the form of work accidents. If a work accident occurs, the worker and the company will suffer losses, such as loss of work, disability of limbs and five senses, and death of workers. For companies, work accidents can hinder the activities of other workers so that they can reduce work productivity, related to legal issues until the company closes.[7]

Based on the problem that has been describe the researcher was interested in conducting a study to determine the relationship between hydration status and concentration levels in rubber farmers in South Lampung.

2. METHOD

This study was an observational research with a cross-sectional approach. This study was conducted to determine the relationship between hydration status and concentration levels in rubber farmers by measuring free variables and bound variables at the same time at the same time. This research was conducted from September 2020 to January 2021 with the research location in Trikora, South Lampung.

The population of this study was rubber farmers in Trikora, South Lampung. Sample was selected with quota sampling technique by paying attention to inclusion and exclusion criteria. The inclusion criterion were rubber farmers who are willing to be respondents and workers who can read and write. The exclusion criteria are having diseases of the urinary system (urinary tract infection), gastrointestinal-hepatobiliary system (constipation, gallstones, diarrhea), and diabetes mellitus, workers who fast, and workers who refuse to be respondents. The number of sample used for this study were 67 people with a minimum sample size of 62 respondents.

Independent variable of this study was hydration status which were measured by measuring the specific gravity of the urine of rubber plantation workers by collecting urine in a urine tube and measuring using a refractometer, while the independent variable was concentration level which were measured with Digit Symbol Substitution Test. Data from this study were analyzed both using univariate analysis to obtain frequency distribution table and bivariate analysis with the Chi-Square or its alternative test. Data analysis was carried out using the Statistical Package for Social Science (SPSS) program with $\alpha = 0.05$. This research has received ethical approval by the Health Research Ethics Committee of the Faculty of Medicine, University of Lampung with number 2957 / UN26.18 / PP.05.02.00 / 2020.

3. RESULTS

Table 1. Respodents Characteristic

Characteristic	Frequency (n)	Percentage (%)
Age (years)		
30-40	26	38.8
41-50	23	34.3
51-55	18	26.9
Working Period (years)		
1-10	30	44.8
11-20	22	32.8
21-30	6	9.0
>30	9	13.4
Education Level		
Elementary school	44	65.7
Junior high school	11	16.4
Senior High school	12	17.9
Sum	**67**	**100**

The respondents in this study were 70 people, but then 3 person got excluded by the exclusion criteria so that the number of respondents in this study was 67 people who met the inclusion criteria and were willing to take part in the research process until completion. From Table 1**.** it can be seen that the largest number of respondents is the group aged 30-40 years, w**ith** 26 respondents (38.8%), and the least is the group of respondents aged 51-55 years with 18 respondents (26.9%). Based on working period the data showed that most respondents 30 (44.8%) were in the 1-10 years working period with, and the least was the 21-30 years group with 6 respondents (9%). Meanwhile, based on the education level of the respondents, the majority of respondent graduates from elementary school for as many as 44 respondents (65.7%), and only 11 respondents (16.4%) were graduate from junior high school.

A. Frequency Distribution of Respondents Based on Hydration Status

The frequency distribution of respondents based on hydration status was categorized into 2 groups, namely euhydrated and dehydrated.

Table 2. Frequency distribution of respondents based on hydration status.

Hydration Status	N	%
Euhydrated	30	44.8
Dehydrated	37	55.2
Total	67	100

In Table 2, it can be seen that most of the respondents 37 workers (55.2%) were dehydrated, and 30 workers (33.8%) were euhydrated.

B. Frequency Distribution of Respondents Based on Concentration Level

The frequency distribution of respondents based on concentration levels was categorized

into 2 groups, namely good and poor concentration levels.

Table 3. Frequency Distribution of Respondents Based on Concentration Level

Concentration Level	N	%
Good	31	46,3
Poor	36	53,7
Total	57	100

In table 3, it can be seen that most of the respondents 36 workes (53.7%) have a poor level of concentration.

B. The Relationship of hydration status with concentration level

Based on the results of the study that has been carried out with bivariate analysis, data on the relationship between hydration status and the concentration level of respondents using the chi-square test in the following table

Table 4. Cross-tabulation of hydration status with concentration level.

Hydration Status	Concentration Level					*P*-value
	Poor		Good		Total	
	n	%	n	%		
Dehydrated	25	67.6	12	32.4	37 (100%)	0.0012
Euhydrated	11	36.7	19	63.3	30 (100%)	

Based on Table 4. The data showed that 63.3% respondent with euhydration had a good concentration level while most of workers with dehydration (67.6%) had poor concentration level. While statistical analysis results of chi square test showed the p-value = 0.012, PR = 1.86. This indicated that there was a significant relationship between hydration status and the concentration level of rubber farmers in South Lampung.

4. DISCUSSION

Rubber farmers at Trikora, South Lampung, which included in this study were 67 workers. The respondents were all men and most of them only graduated from elementary school (SD). The results of hydration status among rubber farmers at Trikora, South Lampung, found that most of rubber farmers still do not pay attention to their hydration status properly as the number of workers with dehydration were 37 respondents (55.2%). Dehydration experienced by rubber farmers can be caused by several factors such as physical activity, work environment, and fluid intake. The physical activity carried out by rubber plantation workers was catagorized as heavy physical activity, since they have to tap the trees, collect sap, and carry rubber and only 25% of the working time used to sit or stand and 75% of the time used to work in the field.[7]

The working environment of rubber farmers is fairly hot and humid, this can affect the hydration status of rubber farmer workers because a hot and humid working environment can make the body evaporates more sweat. When the body temperature rises above 37°C, the body

will try to control the heating mechanism by making the heart pumps more blood, the peripheral blood vessels will dilate, so that more blood will flow to the surface of the skin, as the body tries to release heat. If there is still excess heat in the body, the sweat glands will produce sweat to evaporate to help regulate body temperature. If this mechanism continues without adequate water intake, this situation will lead to dehydration.[6]

The average human body is composed of 75% water and 25% solid material. The average adult human body loses 2.5 L of fluid per day. Approximately 1.5 L of body fluids come out through urine, 500 mL through sweat, 400 mL out in the form of water vapor through respiration and 100 mL out with feces.[8] For workers in hot working environments, water intake must be taken into account. In hot working environments with heavy physical activity, at least 2.8 liters of drinking water are needed for workers, while for light work 1.9 liters is recommended.[6]

Measurement of concentration level among rubber farmers was carried out after working time is over, the farmers were asked to filled out the digit symbol substitution test sheet within two-minutes. The Digit Symbol Substitution Test (DSST) is a cognitive test and is one of the subtests of the Wechsler Adult Intelligence Test (WAIS) which can be used for ages 16-90 years. DSST uses a sheet of paper which requires the subject to match symbols with numbers according to the examples listed. The time used to carry out this test is around 90 to 120 seconds, starting with asking the subject to fill in the first 10 empty boxes without time limit, then the researcher checks the paper to find out whether the respondents understand how fill it or not. If all respondents have understand the filling method then real test is carried out simultaneously on all subjects.[9]

The results of this study found that 35 respondents (52.2%) had a poor concentration level and 32 respondents (47.8%) were at a good concentration level. Concentration level can be affected by several factors, such as hydration status, age, gender, intelligence, and environmental factors like noise. Other reasons why someone has difficulty in concentrating include doing several tasks at once, not getting enough sleep, boring tasks, or thinking about many things at the same time.[10]

Age is one of the factors that affect concentration levels. In this study, the age of rubber farmer workers ranged from 30-54 years. While a person's cognitive ability will decrease at around the age of >60 years, this is because 3 changes occur in an elderly person, namely physiological changes, changes in psychosocial behavior, and cognitive changes. As you get older, a person's ability to concentrate will decrease because the function of brain cells has decreased. Aging may cause a decrease in focus. Whereas sleep deprivation is a major contributing factor to many of these limitations, structural changes in the brain that occur with aging might also be responsible for some of these changes. Memory-processing-related such the hippocampus and the frontal lobes, change anatomically and neurochemically over time. As a result, understanding new information becomes harder as you get older to integrate and retain. Concentration may also be reduced by the normal aging-related loss of neurons

and receptors. As a result, you not only learn information more slowly, but given that you didn't completely learn it in the first place, you can also find it harder to recall it afterward. Facts stored in working memory may disappear before you have an opportunity to solve an issue if processing is slower. Furthermore, as people age, their capacity to carry out executive function tasks decreases. In order to adjust for these shifts, a lot of people learn to rely mostly on habit and put in extra effort when trying to focus on new information.[11]

Hydration status is the state of a person's body that indicates the amount of water in their body. When the body experiences a fluid deficit, this condition is called dehydration. A mild state of dehydration is defined as a loss of body fluids of 1%-2%, moderate dehydration is when a loss of body fluids is around 2%-5% while severe dehydration is when a loss of body fluids is>5%. In cold weather, concentration levels are normally unaffected by a 1%-2% loss of body fluids. However, in the reverse, having exceeded 2% of body fluids deficit (either owing to heat, physical activity, or no water consumption), causing negative effects such as impaired cognitive function including concentration, visual, psychomotor, and physical.[12,13]

Water contributes to 50-70% of human body weight and is essential for daily bodily function. Dehydration can cause serious issues in the body, as well as have negative effects on brain and cognitive performance. The brain contains more water than other parts of the body, making up approximately 75 percent of total brain mass, water is required to perform normal neuronal activity. Studies have indicated that cognitive function decreases following 2% body water loss, however this can be influenced by individual variations in fitness levels and dehydration tolerance. Studies have indicated that increasing hydration levels improves cognitive performance by enhancing mood, energy, and attention. In adults, staying hydrated (about 2L/day) is essential for good cognitive functioning; even minor dehydration can have a negative impact on mood and memory. These include decreased attention, faster reaction times, short-term memory problems, and unpleasant mood swings. A modest loss of water from the body can occur simply as a result of ordinary everyday activities, particularly in individuals who take only about 1L (or 4 cups) of water each day.[14]

All respondents in this study were men so this did not affect the results of the study but gender is suspected to be one of the factors that affect a person's concentration level, there is a hypothesis that men are suspected to have better consciousness than women and women have better abilities than men in maintaining concentration longer.[15,16,17]
To maintain an optimal hydration status, daily water intake must be balanced with outputs. The European Food Safety Authority (EFSA) advised an acceptable water intake of 2.0 L/d for women and 2.5 L/d for males in order to maintain desirable urinary osmolarity and water consumption, based on observations of drinking water, drinks, and food. Assuming food accounts for 20% of total water intake, women should consume 1.6 L/d and males 2.0 L/d. As a result, the European Society for Clinical Nutrition and Metabolism (ESPEN) recommended daily fluid intake at 80% of total water intake.[18]

Intelligence affects concentration

because the level of intelligence increases the speed and precision of a person in solving problems. Individuals with high intelligence levels tend to find it easier to solve problems than individuals with lower or average intelligence levels. Environmental factor such as noise is also a factor that can affect a person's concentration level, this is because noise can interfere with the arousal process/concentration so that when a person is exposed to noise, the acoustic mechanism is disturbed so that when a stimulus is given, the reaction mechanism becomes slower because the concentration is divided and partly centered on noise.[19]

The results of the research on the relationship between hydration status and concentration levels that have been carried out on rubber farmers at Trikora, South Lampung, found that 19 (63.3%) out of 30 respondents who had good hydration status, had a good concentration level. Meanwhile, 25 (67.6%) out of 37 respondents with dehydration, had a low level of concentration. This decrease in concentration levels can be caused by decreased brain perfusion and electrolyte changes due to dehydration, e.g. hypernatremia, increased plasma urea concentration, hypovolemia-related alkalosis, or other unknown hormonal processes.[20] According to some studies, simply 1% dehydration causes a 5% decline in cognitive function. A 2% decrease in brain hydation may lead to short-term memory loss and problems with numerical operations. Prolonged dehydration can result in shrinks brain cells in size and mass, this condition is common in many elderly people who have experienced dehydrated for years.[7]

The prevalence risk result in this study was PR = 1.86 which means that respondents with a poor hydration status of were 1.8 times prevalence of poor concentration compared to workers with euhydarted. Based on the results of the chi-square analysis, the value of p=0.012 was obtained. This shows that there is a meaningful relationship between hydration status and the concentration level of rubber farmers in Trikora Region, South Lampung. This result was in line with the result from a study conducted by Avitriwinar (2017) in a study on the relationship between breakfast habits, hydration status, and anemia status and study concentration of MAN 1 Bandung City students, the result was obtained that there was a relationship between hydration status and concentration (p=0.000).[21] Another study was conducted by Bahrudin (2019) on medical students of the University of Muhammadiyah Malang by dividing them into two groups, namely the control group (not dehydrated) and the treatment group (dehydrated). The results showed that there was a relationship between hydration status and decreased attention (p=0.004).[22] However, different results were obtained by Lentini (2014) in his study, the result was that there was no relationship between hydration status and concentration of thinking (p=0.036).[3]

The effects of dehydration can affect cognitive performance, cognitive performance decreases when the body loses water by 1-2% or more of body weight. Cognitive performance problems that can occur in mild dehydration conditions are poor concentration, short-term memory decline, and mood and anxiety. Water consumption affects cognitive performance in adults, and daily water intake is quite important to maintain optimal cognitive function.[23]

The impact caused if concentration levels decrease can be very detrimental because this can lead to accidents at work. Based on the results of interviews with farmers at Trikora of South Lampung, it was found that there were indeed incidents of work accidents such as injuries due to tapping knives, falling, and being hit by tree scrolls, but many workers did not seek treatment because they were considered minor injuries so they were not recorded by the health center officers. Dehydration that can decrease cognitive performance, including decreased concentration levels, can cause decreased alertness. When workers' awareness levels decrease, this can make it difficult for workers to recognize potential hazards in the surrounding environment so workers become more at risk of work accidents.[24] Dehydration at levels frequently observed in workplace settings in various kinds of industries increases the impact of hyperthermia on performance in activities that rely on the coordination of motor and cognitive functions.[25]

5. CONCLUSION

From the results of the research that has been carried out, it was found that The hydration status of rubber farmers in Trikora of South Lampung was mostly dehydrated, namely 37 respondents (55.2%). The level of concentration on rubber farmers in Trikora of South Lampung is mostly lacking, namely 36 respondents (53.7%). There was a significant relationship between hydration status and concentration levels in rubber farmers in Trikora, South Lampung.

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