

## Pak Rama's Education as a Prevention of Dehydration and Non-Communicable Diseases among Workers in Hot Working Environments

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Submitted article March, 24, 2024  
Reviewed article April, 12, 2024  
Accepted article April, 29, 2024

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### Abstract

Dehydration can impair cognitive function, leading to reduced productivity and heightened risk of workplace accidents. In the long run, it can also contribute to the development of non-communicable diseases like hypertension, urinary tract disease, and obesity. Pak Rama Education (Active Workers Diligently Drink Water) is an educational and empowerment initiative aimed at the worker population, particularly those working in hot areas, to prevent dehydration and non-communicable diseases to enhance workers' understanding of proper hydration and improve their capacity to independently evaluate their hydration levels using an educational approach to promote optimal hydration and demonstrating how to evaluate hydration levels using a urine colour chart at PTPN VII Unit Way Berulu in South Lampung. The participants comprised 50 individuals. The evaluation results revealed that participants had an average pre-test score of 66.7 and an average score on the post-test of 86.6. Wilcoxon test, it was determined that there exists a statistically significant disparity between the mean scores of the pretest and posttest. Pak Rama's instruction has demonstrated its efficacy in enhancing workers' understanding of optimal hydration and their capacity to independently evaluate their hydration levels.

**Keywords:** Optimal hydration; High-temperature conditions; Chronic disorders; Pak Rama educational program; Urine colour chart; Occupational health

### Abstrak

Kedadaan dehidrasi dapat memengaruhi kinerja kognitif sehingga menyebabkan penurunan produktivitas dan peningkatan risiko kecelakaan kerja, serta dalam jangka panjang dapat memicu penyakit tidak menular seperti hipertensi, penyakit saluran kemih, obesitas dan lainnya. Edukasi Pak Rama (Pekerja Aktif Rajin Minum Air) merupakan kegiatan edukasi dan pemberdayaan komunitas pekerja khususnya yang bekerja di lingkungan panas dalam upaya pencegahan dehidrasi dan penyakit tidak menular. Tujuan kegiatan untuk meningkatkan pengetahuan pekerja tentang hidrasi sehat serta meningkatkan kemampuan pekerja dalam melakukan penilaian status hidrasi secara mandiri. Metode penyuluhan tentang hidrasi sehat dan demonstrasi cara menilai status hidrasi menggunakan *urine color chart* di PTPN VII Unit Way pada 50 orang pekerja. Hasil evaluasi rerata nilai pretes peserta adalah 66,7 dan didapatkan peningkatan nilai sebesar 86,6. Berdasarkan analisis menggunakan uji Wilcoxon didapatkan bahwa terdapat perbedaan rerata yang bermakna secara statistik nilai pretes dan postes. Edukasi Pak Rama ini terbukti efektif dalam meningkatkan pengetahuan pekerja tentang hidrasi sehat dan kemampuan dalam melakukan penilaian status hidrasi secara mandiri.

**Keywords:** Edukasi Pak Rama; Hidrasi sehat; kesehatan pekerja; penyakit tidak menular; *urine color chart*

## INTRODUCTION

Exposure to high temperatures can lead to both subjective and objective issues among workers, such as exhaustion, dehydration, and emotional alterations. Outdoor workers exposed to direct sunshine may suffer from heat stress. When labouring in a hot environment, the worker's body will endeavour to equilibrate the heat absorbed and fluid depletion by perspiring in order to sustain a consistent body temperature. Hydration, as defined by Sutarto (2022), refers to the act of maintaining equilibrium between fluid intake and fluid loss in the body. Andayani's research demonstrated a clear correlation between water consumption and the hydration levels of workers. According to Andayani (2013), the most efficient way to preserve the health and productivity of people in the workplace is by ensuring that they have sufficient water intake. Working in hot environments can disrupt the balance of body temperature when the heat received from the environment exceeds what is emitted. When the body temperature rises above 37°C, the body attempts to control heat mechanisms by increasing heart rate, and dilating peripheral blood vessels, so that blood flow increases to the skin's surface to release heat. Fluid loss due to heat exposure without compensation through urine, sweat, faeces, and respiratory vapour is called dehydration. Based on research by Badarsono in 2014, workers exposed to heat are at higher risk of dehydration compared to those not exposed to heat (Badarsono, 2014). Dehydration can affect decision-making and cognitive performance, leading to decreased productivity and an increased risk of occupational accidents (Kenefick, 2007; Utama, 2019). Dehydration is one of the factors that can affect the health, productivity, and safety of workers in the workplace. Some studies have found that even mild dehydration of 1% can disrupt the body's temperature regulation mechanisms. Furthermore, greater levels of dehydration can affect decision-making ability and physical activity performance, ultimately reducing safety levels and increasing the risk of accidents in the workplace (Orysiak, 2022). Chronic dehydration can induce vascular tension, elevating the likelihood of hypertension. Water has also been proven to play a role as a potential protective factor against diseases such as obesity, cardiovascular diseases, and diabetes mellitus (Chang, 2016; Enhörning 2018). Ensuring that workers in hot environments maintain adequate hydration levels is one of the most effective steps to keep workers healthy and safe, as well as to enhance productivity (Veronica, 2010; Graham, 2008). Workers in hot environments may require 2,8 litres up to around 6 litres of fluid, while for those highly active, fluid needs can exceed 6 litres (Robert, 2007). Several studies have found that workers' fluid consumption is often much lower than their actual needs. For example, research in Semarang on laundry workers exposed to temperatures ranging from 30.1°C to 33.3°C showed that the highest fluid intake during an 8-hour shift was only about 601-800 ml, while the average water intake at home reached 1002.85 ml (Daru, 2015). PTPN VII (Persero) Way Berulu Business Unit is one of the business units owned by PTPN VII (Persero), which functions as a plantation. A study conducted by Sakaganta in 2020 on rubber tappers at the PTPN 7 Trikora Unit plantation found that the majority of respondents experienced dehydration, with 37 respondents (55.2%), while respondents with good hydration status were 30 respondents (44.8%) (Sakaganta, 2022). Based on this background, the researchers are interested in examining the relationship between hydration status and concentration levels among rubber farmers in PTPN VII Way Berulu South Lampung.

## GENERAL DESCRIPTION OF THE COMMUNITY, PROBLEMS AND TARGET SOLUTIONS

### General description

PT Perkebunan Nusantara VII was established based on Government Regulation No. 12 of 1996, which is a consolidation of PT Perkebunan X (Persero) in Lampung and South Sumatra Provinces, PT Perkebunan XXXI (Persero) in Lampung and South Sumatra Provinces, the Development Project of PT Perkebunan XI (Persero) in Lahat Regency, South Sumatra Province, and the Development Project of PT Perkebunan XXIII (Persero) in Bengkulu Province. PT Perkebunan Nusantara VII (Persero) or PTPN VII operates in the plantation sector by managing various types of cultivated plants such as rubber, palm oil, sugarcane, and tea. PTPN VII (Persero) has business networks spread across three provinces: Lampung, Bengkulu, and South Sumatra. PTPN VII (Persero) Trikora Business Unit in South Lampung is one of the business units owned by PTPN VII (Persero) which functions as a plantation. The cultivated commodity established new rubber plantations, seedling cultivation, maintenance during rubber growth, and latex tapping

Table 1. Target description

No	Name of target	Characteristics of target	Amount	General problems or targets
1	Management, Factory Workers, Farm Workers	Male and Female	50 workers	Low knowledge about healthy hydration and low hydration status.

### Problem

Rubber plantation workers in PTPN VII Unit Way Berulu faced 2 problems to be solved.

1. The workers lack of knowledge about healthy hydration status
2. The workers are unable to assess their hydration status independently

### Target Solution

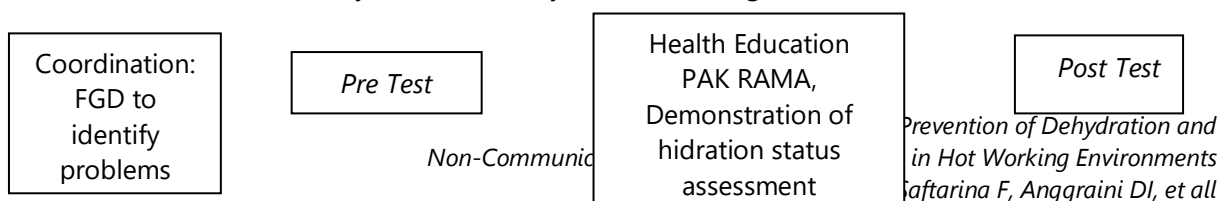
1. PAK RAMA's health education about healthy hydration.
2. Health education and demonstration on self-assessment of hydration status.

Tabel 2 Problem and solution

No	Problem	solution	Indicators of goal
1	The workers lack knowledge about healthy hydration status.	PAK RAMA's health education about healthy hydration	Improvement in knowledge is measured by the post-test score.
2	The workers are unable to assess their hydration status independently.	Health education and demonstration on self-assessment of hydration status	Improvement in ability is measured by the post-test score.

## METHOD

In implementing this program, the method that we used was the lecture and demonstration approach by Knowledge transfer programs through Focus Group Discussion (FGD) with the Indonesian Hydration Working Group (IHWG), the Head of UPTD PTPN VII Way Berulu Business Unit in South Lampung, Management Representatives, Factory Workers, and Farm Workers. The last program are evaluation of workers' knowledge using pre and post-test questioners. The schematic of community service activity is shown in Figure 1.



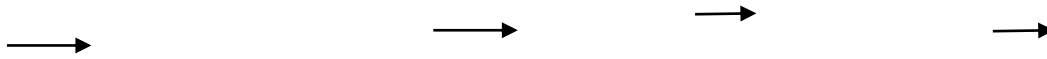


Figure 1. Method of Community Service Activity

## RESULTS AND DISCUSSION

This community service activity began by coordinating the implementation in September 2023 with the Indonesian Hydration Working Group (IHWG) and coordinating with PTPN VII Unit Way Berulu South Lampung in October. The coordination was aimed to identify the community problem and to arrange the solution, from the FGD it was agreed that the service activity would be held on November 17, 2023. The community service activities included assessing workers' knowledge of healthy hydration and their ability to assess hydration status independently using a questionnaire, followed by PAK RAMA's health education about healthy hydration and a demonstration on how to assess hydration status independently using a urine colour chart, which concluded with a post-test. The service activity started with workers completing a pre-test using a questionnaire to assess their knowledge of healthy hydration and their understanding of self-assessment of hydration status. The pre-test consisted of 15 questions. The pre-test results from the workers at PTPN VII Unit Way Berulu South Lampung yielded an average score of  $66.7 \pm 0.5$ . Analysis of participant responses revealed that the majority of participants were unaware of the fluid requirements for individuals working in hot environments. Additionally, many participants were unfamiliar with the signs of dehydration and the long-term effects of dehydration. The activity continued with PAK RAMA's health education on healthy hydration and health education on self-assessment of hydration status using a urine colour chart. This material presentation was conducted by the service team and followed by a discussion session. From the discussion with the participants, it was observed that farm and factory workers often limit their fluid intake because they are concerned about frequent urination due to the distant location of toilets from their activity areas. Another issue raised by the workers was the lack of drinking water sources around the workplace. Additionally, many workers consume sweetened coffee daily, which can trigger more frequent urination, and excessive sugar consumption, which is not beneficial for health. The health education activity focused on knowledge of hydration status and dehydration, the benefits of drinking water and adequate hydration, the impact of fluid deficiency on workers, and self-assessment of hydration status using a urine colour chart. The implementation of the education activity was divided into two sessions: a material presentation and a question-and-answer discussion with participants. The material was presented in a simple and easily understandable manner, providing practical tips to improve hydration intake for workers in hot environments. Participants listened attentively to all the material presented and actively participated in the question-and-answer discussion. The material was delivered using visual aids, leaflets containing information about hydration, posters displayed in several locations as reminders of healthy hydration, and urine colour chart stickers that could be placed in toilets so that workers could monitor their hydration status. After the health education session, we administered a post-test using the same questionnaire and found an increase in the participants' average score to  $86.6 \pm 0.3$ . The data were analyzed using a paired t-test. The results of knowledge before and after the health education are shown in Table 3.



Table 3 : Knowledge Level Before and After Health Education

Knowledge	Mean $\pm$ SD	p
Before Education	66,7 $\pm$ 0,5	
After Health Education	86,6 $\pm$ 0,3	0,03

The research findings regarding workers' knowledge correlate significantly with hydration status (Randa et al., 2014). Fluid education has a significant impact on fluid knowledge, fluid adequacy, and hydration status with a p-value of 0.001 (Rahayu, 2018). Several studies indicate that body fluid replacement during work under heat stress only reaches about half to two-thirds of the fluid loss that occurs (Brake, 2012). According to the National Institute for Occupational Safety and Health (NIOSH), it is recommended that workers in hot environments consume 250 ml of water every 30 minutes (Jacklitsch, 2016). This recommendation was also suggested based on the study of Sunardi. et al., which found that it was crucial to have a regular drinking pattern in order to achieve the recommended daily fluid intake (Sunardi et al., 2022). Even if not feel thirsty, workers in hot working environments need to continue drinking fluids regularly. The significance of providing education on knowledge about hydration status is profound as it is closely related to the individual's fluid requirements, which are influenced by several factors, including physical activity, environmental conditions, health status, age, dietary patterns, and overall individual characteristics (Nofianti, 2019). Workers performing heavy tasks in hot environments are at high risk of dehydration (Huda, 2019). Having a habit of drinking enough can prevent body dehydration after exposure to heat for a certain period (Jacklitsch, 2016). As one of the initiation methods carried out in this activity, souvenir distribution in the form of large drinking bottles with a volume of 1.5 litres is expected to help change the behaviour of workers so that they can adopt healthy hydration practices. The availability and accessibility of drinking water are also important factors to consider in various workplaces. The location of drinking water, including the distance between the water supply and the work area, should be taken into account (Irwan, 2019). According to the International Labour Organization, drinking water should be placed in locations easily accessible to workers (ILO, 2012). Workers tend to be reluctant to take drinking water if it is difficult to reach (Xiang, 2015). Exposure to heat and dehydration in the workplace can impact workers' health. Heat exposure and dehydration can affect the body's physiological responses, which may lead to health issues. Some health problems that may arise due to heat exposure include heat stroke, heat exhaustion, heat syncope, heat cramps, and heat rash, as well as potential chronic disorders (Aulia & Mayasari, 2023). This can reduce productivity, increase the risk of workplace accidents, and cause absenteeism due to illness (Andayani, 2013). Prevention strategies need to be implemented to protect workers from heat exposure in the workplace and reduce the risk of injuries or illnesses caused by heat exposure (Aulia & Mayasari, 2023). Chronic dehydration can have an impact on kidney function over time, as evidenced by research showing a correlation between water intake and conditions such as kidney stones, chronic kidney disease, and urinary tract infections (Sontrop, 2013; Alqahtani, 2021). The kidneys play a crucial role in maintaining fluid and electrolyte balance in the body. Dehydration can strain the kidneys and increase the risk of kidney stone formation, as well as raise the risk of urinary tract infections. Dehydration can also increase the risk of urinary tract disorders, such as urinary tract infections (UTIs), as insufficient water can lead to an increase in bacterial concentration in the urine (Alqahtani, 2021). Chronic dehydration can induce vascular tension, elevating the likelihood of hypertension. Water has also been proven to play a role as a potential protective factor against diseases such as obesity, cardiovascular diseases, and diabetes mellitus (Chang, 2016; Enhörning 2018). Dehydration may

result in elevated blood pressure as the body endeavours to uphold sufficient blood volume (Enhörning 2018). Thus, the prevention of dehydration is strongly needed to be implemented especially in hot working environments.

## CONCLUSIONS AND SUGGESTIONS

The community service activity in the form of health education on PAK RAMA about healthy hydration and self-assessment of hydration status using a urine colour chart found that there was an increase in knowledge and skills by 19.9%, assessed using pre-post test questionnaires among workers at PTPN VII Unit Way Berulu in South Lampung. It is hoped that the health education provided will improve hydration status. This service activity needs to be conducted continuously to create healthy and productive workers.

## ACKNOWLEDGEMENT

Thank you to the Faculty of Medicine, University of Lampung for supporting this community service program, and the Indonesia Hydration Working Group for providing the funding for our community service program. Also, thank you to PTPN VII Unit Way Berulu for giving us an opportunity and the facilities for our program.

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