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# Effect of Green Tea on Reducing Uric Acid Levels in Employees in Kupang City

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**ABSTRACT**

**Background:** Gout or uric acid is the result product of purine metabolism, as one of the constituents of nucleic acids. Nucleic acids in the cell nucleus are one of the components contained in purines and the cause of uric acid formation. High uric acid levels can be prevented with green tea, which contains antioxidants that can reduce inflammation.

**Objective:** To know the effect of giving green tea on lowering uric acid levels.

**Methods:** An experimental study was conducted involving 30 participants aged ≥25 years and male, divided into a treatment group (n = 15) and a control group (n = 15). The treatment group consumed 240 ml of green tea twice daily for one week, while the control group received no intervention. Total cholesterol levels were measured using capillary blood and cholesterol test strips pre- and post-intervention. Data analysis was performed using the paired t-test.

**Result:** The treatment group showed a significant decrease in uric acid levels (mean before treatment: 5.88 mg/dL; after treatment: 5.28 mg/dL; p = 0.04). The control group showed a significant increase significant (before treatment: 5.86 mg/dL; after treatment: 6.69 mg/dL; p = 0.02).

**Conclusion:** Green tea consumption for one week significantly reduced uric acid levels, demonstrating its potential as a natural remedy for managing gout.

**Keywords**: Green tea, Uric acid levels

## INTRODUCTION

The World Health Organization (WHO) states that gout sufferers can reach 230 million and this number is expected to continue to increase strongly by 2020. Uric acid disease continues to increase in both developed and developing countries. The prevalence of gout in China was found to be 25.3%, while in the United States the incidence of gout can reach 2-13%. In Indonesia, 81% of patients are affected by gout (Ariani, et al, 2022). The prevalence of gout in Indonesia is increasing, estimated to occur in 840 people out of every 100,000 people. The prevalence of gout in Indonesia occurs at the age of under 34 years by

32% while those over 34 years by 68% in NTT reached 5.13%. According to Riskesdas in 2018, the prevalence of gout disease based on health diagnosis in Indonesia is 11.9% and based on diagnosis or symptoms 24.7% if based on age criteria, high prevalence at age ≥ 25 years. Based on the 2018 Basic Health Research data, the most sufferers from joint disease based on gender are more experienced by women with a percentage of 8.5%.[1-4]

Uric acid disease is the end product of purine metabolism, which is one of the constituents of nucleic acids. The accumulation of monosodium crystals in the body itself can cause gout. Gout is a progressive disease caused by the deposition of monosodium urate (MSU) crystals in the joints, kidneys, and other connective tissues due to hyperuricemia becoming chronic. High uric acid levels in the blood that exceed the normal limit cause a buildup of uric acid in the joints and other organs. This buildup of uric acid can cause aching, painful, and inflamed joints.[5,6]

Excess body weight can increase the production of uric acid in the body, as well as reduce the kidneys' ability to excrete uric acid. Obesity causes inflammation in the body, metabolic disorders, including increased blood sugar and insulin levels, which can increase the risk of uric acid. A survey conducted on employees in Kupang City found 37 employees with a normal BMI (43.5%), 37 employees with obesity (43.5%), 7 employees with obesity grade 1 (8.2%), 2 employees with obesity grade 2 (2.1%), and 3 employees with malnutrition (3.5%). In general, gout treatment is often done using synthetic drugs such as allopurinol. However, the use of synthetic drugs can cause side effects such as diarrhea, nausea and vomiting, and can also cause allergic reactions. The side effects caused by drugs make some people choose to use medicinal plants that are believed to have healing abilities with minimal side effects. A plant that can be believed to reduce uric acid levels is green tea. Green tea can be an alternative treatment to lower uric acid levels in gout sufferers. The antioxidant content called catechin in green tea is believed to be effective in inhibiting the production of uric acid in the body. In addition, green tea can also remove uric acid crystals and dissolve kidney stones [1]. In a study, green tea extract with a dose of 600 mg/kgBB was able to reduce uric acid levels by 55.25%. However, it should be noted that the effectiveness of green tea can vary depending on the individual and health conditions. Meanwhile, allopurinol is a conventional drug commonly used to treat gout. Allopurinol works by reducing the production of uric acid in the body. However, this drug can have side effects such as diarrhea, nausea, and headaches. There are many cases of gout but few have been reported as case studies so this is the background for this study to determine the effect of giving green tea on reducing uric acid levels, especially in employees in Kupang City.[7-0]

## METHODS

This study will be divided into 2 groups, namely the case group and the control group, then the intervention will be given to the case group for one week. The research was conducted in July at the Social Service of NTT Province. This type of research is quasi-experiment with control group.

## SAMPLE

This study received ethical approval from the Health Research Ethics Committee of the Faculty of Medicine and Veterinary Medicine, Nusa Cendana University (Reference Number: 36/UN15.16/KEPK/2023). Employees of the NTT Provincial Social Service were randomly selected as participants. The study was conducted at the Social Service Office of NTT Province.

The sample size was calculated using the Isaac and Michael formula, resulting in a total of 30 participants, divided into two groups of 15 each. Participants were selected based on the following inclusion criteria:

active male employees aged >25 years, who fasted for 12 hours before uric acid examination, did light exercise, were willing to consume green tea, and were generally healthy. Individuals who were taking medication or undergoing treatment for heart and blood vessel disease, diabetes mellitus, or kidney failure were not included in the study. All participants provided informed consent prior to the study.

## ANALYSIS

Data distribution was assessed using the Shapiro Wilk test, appropriate for sample sizes smaller than 50. A p-value < 0.05 indicated non-normal distribution, while a p-value > 0.05 indicated normal distribution. For normally distributed data, a paired t-test was used to compare pre- and post-test cholesterol levels. For non-normally distributed data, the Mann-Whitney test was employed to analyze the results.

## RESULT

### Participant characteristics

This study included a treatment group consisting of 15 male respondents and a control group consisting of 15 male respondents. The participants' ages ranged from ≥ 25 years, with the treatment group mostly consisting of individuals aged 35–39 years (5 participants), while the control group had the highest representation in the 55–59 years age range.

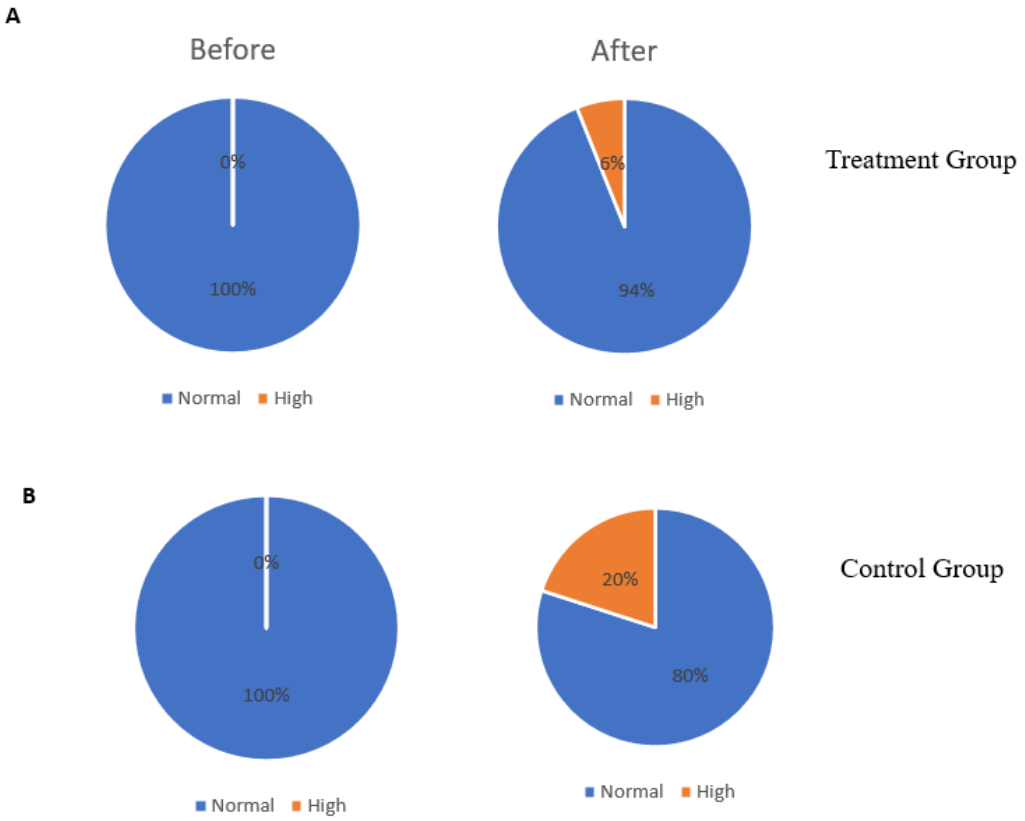


**Figure 1. Classification of uric acid levels within the treatment and control groups**

### Uric Acid levels pre- and post-treatment

The cutoff value for uric acid for this study was 7 mg/dL. In the treatment group, the mean uric acid level

before treatment was 5.88 mg/dL, which decreased to 5.28 mg/dL after treatment. The minimum uric acid level in this group was from 3.50 mg/dL to 3.20 mg/dL, and the maximum level decreased from 7.00 mg/dL to 7.10 mg/dL.

In contrast, the control group showed a mean uric acid level of 5.86 mg/dL before treatment, which increased to 6.69 mg/dL after treatment. The minimum uric acid level in the control group increased from 3.10 mg/dL to 5.30 mg/dL, while the maximum uric acid level decreased from 6.90 mg/dL to 8.70 mg/dL. The Shapiro-Wilk test confirmed that the data were normally distributed.

**Uric Acid level classification**

Classification Uric acid levels were classified into two categories: Normal (3.5 mg/dL -7 mg/dL) and high (≥7 mg/dL). In the treatment group and control group, participants who had uric acid levels within normal limits were selected.

Among the treatment group, 9 participants (60%) reported a decrease in uric acid levels, 5 participants (33%) showed no increase, and 1 participant (7%) showed no change. In contrast, in the control group, 8 participants (53%) showed no decrease in uric acid levels, 7 participants (47%) experienced a decrease in uric acid levels.

**The uric acid levels on treatment and control groups**

Figure 2 compares the uric acid levels of the treatment and control groups before and after treatment. In the treatment group, the average uric acid level decreased significantly from 5.88 mg/dL to 5.28 mg/dL ($p = 0.04$). In the control group, the average uric acid level increased from 5.86 mg/dL to 6.69 mg/dL, ($p = 0.02$).

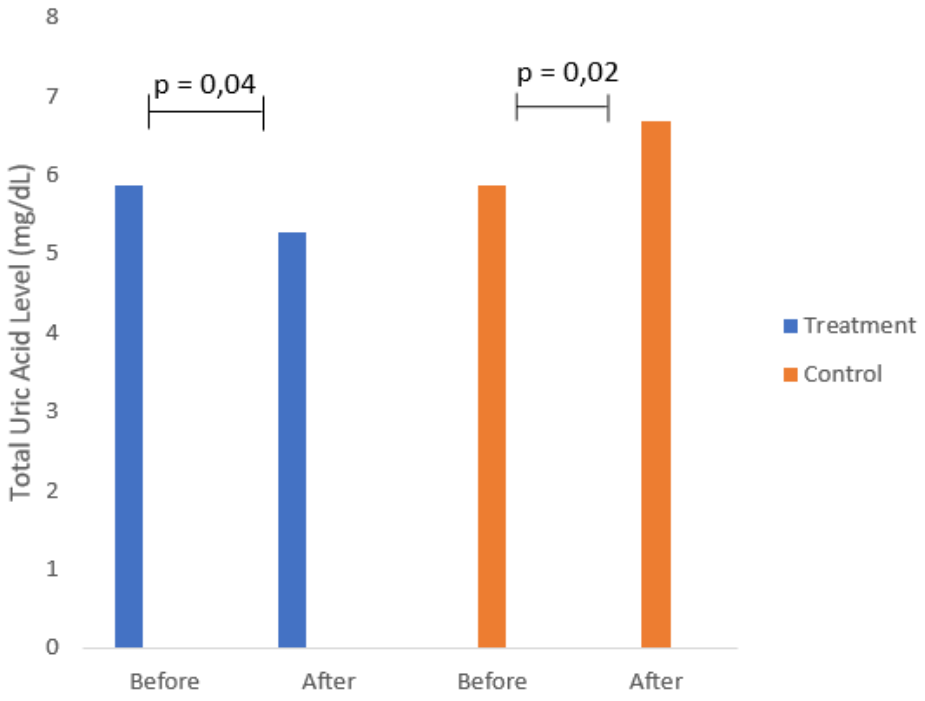


**Figure 2. Total uric acid levels before and after treatment in the treatment and control groups (*p < 0.05; **p < 0.005; paired t-test).**

## DISCUSSION

This study showed a decrease in uric acid levels after consuming green tea, highlighting its potential as a natural intervention to manage Gout. However, the study did not take into account dietary factors, which may influence the post-treatment uric acid results. The uric acid lowering effect of green tea is attributed to its bioactive compounds, especially catechins such as epigallocatechin gallate (EGCG), which play an important role in lipid metabolism.

Uric acid at high concentrations can cause oxidative stress by increasing the formation of ROS. Oxidative stress is an imbalance of free radicals with antioxidants in the body. Increased oxidative stress can cause neurodegenerative diseases, cardiovascular disease, premature aging and even cancer, to prevent an increase in free radicals, antioxidants are needed.[11-12]

Antioxidants are compounds that can neutralize, reduce and inhibit the formation of free radicals in the body by becoming electron donors to free radicals so that unpaired electrons in free radicals will become paired so that they can stop damage in the body. One example of exogenous antioxidants are vitamins C, E and green tea. The formation of ROS through enzymatic oxidation reactions with the xanthine oxidase enzyme system pathway which is a member of the molybdoenzyme family that catalyzes the final stage of purine degradation, namely the transformation of hypoxanthine and xanthine into uric acid. The XO reaction also produces ROS by-products, namely superoxide radicals, which are then converted into hydrogen peroxide.[13-14]

Uric acid is the end result of the metabolism of purines, most of these purines come from food, especially meat, offal, some types of vegetables and nuts. Uric acid levels in the body can be influenced by several factors. In this study in the case group there were several respondents who had increased uric acid and at the time of the food recal the foods consumed were chicken meat, tofu, kale, spinach, tempeh, fried fish, goat curry with an uncertain amount.[5]

High purine content is mainly found in offal, shellfish, crabs, and anchovies, there are also vegetables such as spinach and kangkong and beans. Purine intake is the most powerful risk factor associated with the incidence of hyperuricemia. This is still less realized by the community about excessive purine consumption can increase uric acid levels in the blood by paying less attention to a diet that contains purines including food frequency, type of food, and amount of food.[15]

## CONCLUSSION

Green tea consumption for one week (twice daily) significantly reduced uric acid levels among employees at the Social Service of Nusa Tenggara Province, Indonesia. These findings suggest that green tea may serve as an effective natural remedy for managing uric acid levels. Further studies are recommended to explore the long-term effects of green tea on uric acid and its interactions with dietary and lifestyle factors.

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