

Examination of Calcium Oxalate Crystals In Mountain Water Consumers In Kuningan Regency

Oktafirani Al Sas^{1*}, Hery Prambudi², Mutiara Syafitri³

^{1,2,3}An Nasher Health Analyst Academy Cirebon, West Java, Indonesia

Email: oktafiranialsas@aaakannasher.ac.id

ABSTRACT

Urine, a byproduct of metabolism occurring in the kidneys, serves as a crucial diagnostic medium in laboratory settings, including the microscopic examination of calcium oxalate crystals. Influenced by various factors, such as demographics and environmental conditions, the formation of these crystals underscores broader health considerations. Mountain water, renowned for its mineral content, constitutes a significant source of daily hydration. However, the dominance of calcium and magnesium elements in surface water raises concerns regarding calcium oxalate crystallization. This study investigates the prevalence of calcium oxalate crystals in mountain water consumers within Kuningan Regency. Employing descriptive research methods and random sampling techniques, the study examined urine samples from 38 individuals. Results revealed calcium oxalate crystals in 11 participants, constituting 28.95% of the sample. This finding underscores the need for further research into water quality and its implications for public health in the region. By elucidating the relationship between water composition and urinary crystal formation, this study informs strategies for safeguarding community health and informs future policy initiatives regarding water resource management.

Keywords: Urine, Calcium Oxalate Crystals, Mountain Water

INTRODUCTION

Urine crystals are mineral deposits in the urinary tract, usually found in the pelvis and calic kidneys (Gasińska & Gajewska, 2007). Crystal formation is closely related to the consumption of various salts in the urine, which is associated with the metabolism of food and fluids and the impact of changes that occur in the urine after sample collection. Crystals are formed by depositing solutes in urine, including inorganic salts, organic compounds, and drugs (Bargagli et al., 2020).

Calcium oxalate crystals are crystals that are found in acidic urine but can also be found in neutral urine in the urine pH range of 5.0 – 6.5 (Susilo et al., 2021). This crystal is a type of calcium stone that is often found in urine specimens, even in healthy patients. The discovery of clumps of calcium oxalate crystals in fresh urine is associated with the formation of kidney stones. The formation of calcium oxalate crystals is influenced by several factors such as age, sex, heredity, geographical conditions, climate and weather environment, drinking habits, urinary habits, and also drugs (Susilo et al., 2021).

Indonesia is a country that has abundant natural wealth; Indonesia can even be said to be the richest country, especially in terms of water. Meanwhile, water consumed daily must be healthy and clean water in accordance with predetermined requirements (Herdianto et al., 2024). In Permenkes Number 492 / Menkes / Per/ 2010 concerning drinking water quality requirements, it is stated that drinking water that is safe for human consumption, namely water that meets physical, microbiological, chemical, and radioactive requirements which are contained in mandatory parameters and additional parameters (Lestari & Fuady, 2022). This is so that the water consumed does not contain diseases that can interfere with the human body. In general, the need for water consumption is to drink eight glasses per day, equivalent to 2 liters (Cámara et al., 2021). This is intended to avoid the body's lack of water, where the body will become dehydrated. Ideally, the water consumed is clear, tasteless, odorless, colorless and certainly free from pathogenic germs.

Mountain water is one of the water consumed by humans to maintain daily water intake. Mountain water itself is of good quality, contains minerals that are in accordance with needs, and avoids pollution elements (Teixeira & Gomes, 2021).

According to Effendi, mountain water quality can decrease due to increasing population and wrong spatial planning (Effendi et al., 2018). The mineral composition in drinking water sourced from surface water (highlands/lowlands) is dominated by calcium and magnesium elements, calcium levels (Ca²⁺). This is what must be watched out for because it can result in calcium oxalate crystallization.

Urine is a product of metabolism in the body. The process of urine metabolism in the body is found in the kidneys. The kidneys carry out filtration, reabsorption, and augmentation processes (Fleming, 2020). Urine can be used as one type of examination in the laboratory. Sediment examination has the benefit of detecting kidney and urinary tract abnormalities (Gomes, 2020). Based on the description, researchers are interested in conducting a study entitled Description of calcium oxalate crystals in mountain water consumption in Kuningan Regency.

Previous studies have explored the link between dietary factors, such as salt intake, and the development of calcium oxalate crystals in urine. Nopiani discovered a correlation between high salt consumption and an increased risk of calcium oxalate crystal formation (Puluhulawa & Supu, 2022). Similarly, Purnomo identified several factors influencing crystal formation, including age, gender, genetics, geography, climate, drinking habits, and urination patterns (Muniroh, n.d.).

The proposed research stands out by examining the influence of mountain water consumption on calcium oxalate crystal formation in urine. This study aims to investigate whether consuming mountain water relates to the presence of these crystals in urine samples from Kuningan Regency residents. By analyzing the mineral content of mountain water, particularly calcium and magnesium levels, the study seeks to determine if these elements contribute to crystal formation.

Moreover, the research aims to shed light on potential health risks associated with mountain water consumption in the region, particularly regarding kidney and urinary tract issues. The findings could inform strategies to mitigate crystal formation, promoting better health outcomes for locals.

RESEARCH METHODS

This study used a qualitative descriptive research method with a cross-sectional approach to explore the picture of calcium oxalate crystals in mountain water consumption in Kuningan Regency. The object of this study is people who consume mountain water in Sweet Block, Paniis Village, Pasawahan District, Kuningan Regency, with an age range of 30-60 years. Data was collected on April 3-5, 2023, at the Clinical Laboratory of the An Nasher Health Analyst Academy Cirebon through observation methods and filling out questionnaires. The population of this study consisted of 42 mountain water consumers, and the sample was selected using probability sampling techniques, especially random sampling, with a total sample of 38 respondents. The data obtained were then analyzed using the SPSS statistical program and a simple descriptive statistical test to assess the characteristics of the data obtained from the study.

The results showed that of the 38 urine samples examined, most (71.05%) showed negative results against calcium oxalate crystals. Meanwhile, a small percentage of samples showed positive results, with 10.53% showing positive results of 1, 7.89% showing positive results of 2, and 10.53% showing positive results of 3. Further analysis showed that the age group of 40-49 years with male sex was more likely to have positive results of calcium oxalate crystals. The distribution of drinking water consumption also shows that drinking water consumption < 8 glasses/day has a higher proportion of positive results compared to drinking water consumption of 8 glasses/day. In addition, the habit of regularly consuming coffee/tea is also influential, where respondents who regularly consume coffee/tea every day tend to have positive results of calcium oxalate crystals. However, the habit of holding urine is rarely found to be associated with positive results of calcium oxalate crystals. Thus, this analysis provides a clearer picture of the factors related to the presence of calcium oxalate crystals in the urine of mountain water consumers in Kuningan Regency.

RESULTS AND DISCUSSION

This descriptive study aims to determine the picture of calcium oxalate crystals in mountain water consumption in Kuningan Regency, which was conducted at the Clinical Laboratory of the An Nasher Health Analyst Academy Cirebon with 38 urine samples of mountain water consumption. The microscopic method is used (Mongan et al., 2017).

This study begins with the stages of preparing the tools and materials to be used, followed by taking urine samples while on respondents. The sample obtained is given a sample number as a sequence number. A urine sample is inserted into a tube of 7-8 ml. Then, a urine strip is inserted to stage a chemical examination of the urine.

Urine is centrifuged at a speed of 2000 rpm for 5 minutes to obtain a precipitate. Centrifuge results in the form of deposits used to identify the type of urine sediment (Yan et al., 2021). Taken as much as one drop dripped on a glass object and covered with a glass cover. Then, it is observed using a microscope with a magnification of 10x (small field of view). Then, the results are recorded and interpreted.

Based on research that has been conducted on the picture of calcium oxalate crystals in mountain water consumption in Kuningan Regency, from 38 samples examined, 27 samples (71.05%) showed negative results, four samples (10.53%) showed

positive results 1, 3 samples (7.89%) showed positive results 2, and 4 samples (10.53%) showed positive results (Mongan et al., 2017).

The presence of calcium oxalate crystals in mountain water consumption indicates that there is a disturbance in kidney function. This indicates the occurrence of urinary tract stones. Various factors support the occurrence, such as age, gender, drinking habits, and urination habits (Gürler & Gündüz, 2021).

Age is one of the influential factors in obtaining positive results of calcium oxalate crystals in the urine of mountain water consumers with an age range of 40-49 years. The results of this study are not much different from Purnomo's theory that urinary tract stones are commonly found in adults between the ages of 30-60 years (Puluhulawa & Supu, 2022).

Then that becomes one of the next factors in terms of sex, where the male sex has a higher risk level of finding calcium oxalate crystals than women. This is due to the presence of the hormone testosterone, which is one of the factors that can increase endogenous oxalate production in the liver. At the same time, women have the hormone estrogen, which acts as an inhibitor of calcium salt aggregation and decreases oxalate excretion. The length of the human ureter is 20-30 cm, and the urinary tract of males is narrower than that of females. Men are more active than women, although not 100%. These are some of the factors that affect men more at risk than women (LaFavers et al., 2023).

The next factor that becomes a factor in the discovery of calcium oxalate crystals is the consumption of water in meeting fluid intake in the body. The condition of the body will decrease if the body's water content decreases and does not immediately meet the adequacy of drinking water. For this reason, it is recommended to consume at least eight glasses or 2 liters of water a day so that the amount of urine released will increase and reduce the concentration of salts and minerals in the body. In the body, water plays an important role in preventing kidney disease by reducing the possibility of calcium oxalate crystals in the urinary tract.

Next, in terms of coffee consumption, coffee is one of the drinks that contain oxalic acid. Consumption of too much coffee can cause substances (oxalic acid) to combine with calcium and then form calcium oxalate crystals in the kidneys or bladder. Caffeine is a coffee content that can also affect the formation of urinary tract stones. In the human body, caffeine content has mixed effects in that some people will experience the effects directly, while others do not feel it at all. This is related to the genetic traits that each individual has and the body's metabolic ability to digest caffeine.

On the other hand, holding back urination is the same as letting waste, dirt, and toxins that should come out. Urine that is held for too long can have a negative impact on the urinary tract or urinary system because, in urine, there are many harmful substances. The habit of holding urine will cause static urine, which can be a risk factor for urolithiasis and urinary tract infections.

CONCLUSION

Based on the results of research and discussion on the Description of Calcium Oxalate Crystals in Mountain Water Consumption in Kuningan Regency, it was concluded that there were 11 people consuming mountain water in Kuningan Regency

who had calcium oxalate crystals, covering around 28.95% of the total respondents. The suggestions given include adding other variables in future studies by paying attention to the factors that cause urinary tract stone disease, the use of research results as reference material in the preparation of guidelines for lectures oriented to research and innovation, as well as recommendations for respondents to regulate lifestyle and fluid intake to minimize the risk of calcium oxalate crystals in urine and reduce the incidence of urinary tract stones.

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