

# DESCRIPTION OF URIC ACID LEVELS IN ELDERLY USING POINT OF CARE TESTING (POCT) METHOD IN PUSKESMAS KOTA UTARA

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## ABSTRACT

Uric acid is the end product of purine metabolism in the form of nucleoprotein, which is a component of nucleic acids found in the nuclei of body cells. Someone will be said to suffer from gout if the examination results show uric acid levels above 7 mg/dl for men while more than 6 mg/dl for women. In general, this uric acid disease will attack the elderly. Elderly is aged > 60 years and over. Normally have experienced various setbacks of physical abilities, as well as physiology. In the elderly, physical endurance has decreased, it is vulnerable to old age, physical endurance is getting weaker and worse. This study aims to find out and determine the description of uric acid levels in the elderly using the point care of testing (POCT) method at the North City Health Center, Gorontalo City. The method in descriptive research uses a quantitative approach and the sampling method used in this study is purposive sampling with certain criteria or considerations in taking samples. From the results of the research conducted from 14 to 23 November 2022 it showed that examination of uric acid levels at the North City Health Center on 31 samples obtained normal results in 13 samples (49.9%) and abnormal results in 18 samples (58.1%) , while there were 16 women (51.6%) and 15 men (48.4%).

**Keywords:** Gout, Elderly, POCT

## INTRODUCTION

Elderly is aged > 60 years and over. Normally have experienced various setbacks of physical abilities, as well as physiology. In the elderly, physical endurance has decreased, it is vulnerable to old age, physical endurance is getting weaker and worse. An increase in the number of elderly population will increase health problems in the elderly. Health problems that occur due to the aging process cause many changes in the body of the elderly such as psychological, social changes and functional decline of the body [12].

This decrease in physiological abilities can cause them to be unable to be given heavy and high-risk tasks and responsibilities. At an advanced age,

physical endurance has experienced a decline in function so that it is susceptible to various types of diseases, problems that occur are caused by weakened immunity and physical strength as well as the body's ability to ward off disease attacks which are increasingly weakened, so that health problems are more common [23].

One of the diseases that attacks the elderly is uric acid or known as gout. Gout arthritis (gout) is a disease that is often found in men aged between 30-40 years and in women aged 55-70 years, the incidence of women is rare except after menopause. This decrease in functional capacity causes the elderly to not be as effective in responding to stimuli as younger people. The decreased capacity to respond to stimuli makes it

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difficult for the elderly to maintain a stable physical and chemical status of the body [9].

Gout is a very painful arthritis caused by the buildup of crystals in the joints, due to high levels of uric acid in the body. The joints that are mainly attacked are the toes, knees, heels, wrists, fingers and elbows. In addition to pain, gout can also make joints swell, inflamed, hot and stiff so that sufferers cannot carry out their usual activities and sufferers cannot seek treatment due to a lack of economy [13].

Indonesia is the fourth largest country in the world whose population suffers from gout, the prevalence of gout in Indonesia is 81%. WHO in 2018 stated that since five years ago it has been estimated that several hundred million people have suffered from joint disease (gout). The prevalence of uric acid in the world is 34.2%. WHO states that an increase in gout sufferers also occurs in developing countries, one of which is in Indonesia.

In Indonesia in 2016 the prevalence of gout arthritis was 21.3%. and the prevalence was higher than in 2013 (10.3%). This is due to the lack of good behavior of the population, such as lack of exercise and unhealthy eating patterns. The prevalence of gout arthritis in Indonesia is increasing [8].

The prevalence of gout arthritis based on diagnoses by Indonesian health workers is 11.9% and based on diagnoses or symptoms 24.7% when viewed from age characteristics. compared to men (6.14%). It should be noted that in Indonesia gout arthritis is suffered at an earlier age compared to western countries 32% of gout arthritis attacks in Indonesia occur at the age of under 34 years

The prevalence of joint disease in Indonesia is 11.9%. The highest prevalence by region was in Bali Province at 19.3% and prevalence in Gorontalo Province at 10.4%. The prevalence of joint disease in Indonesia is also divided by age. Age 55-64 years by 45%, 65-74 years by 51.9%, and age 75 years and over by 54.8%. With the high

prevalence of joint disease in the elderly, causing joint disease to rank second after hypertension. In Gorontalo City, the prevalence of gout is divided by age. In 2014, there were 394 cases of gout arthritis aged 45 years to age > 70 years. In 2015 there were 353, in 2016 there were 393 and in 2017 there were 365 cases [19].

In Gorontalo City, arthritis has become the second ranked disease in the last year. There are around 8462 people, the most of whom are women, namely 5683 people and men, namely 2779 people. Based on the Gorontalo provincial data obtained, there were 98 people suffering from gout in 2019. While the initial data obtained in the Gorontalo district in 2019 totaled 1,083 people and in 2020 the number of gout sufferers increased very sharply to 1,500 people [4].

The initial observation that I made at the North City Health Center was that there were still a lot of gout sufferers at the North City Health Center, namely 697 sufferers. From this case, researchers are interested in conducting research on the description of uric acid levels at the North City Health Center, especially in the elderly.

Uric acid flows in the blood vessels, because uric acid is the end product of the body's natural metabolism. The human body produces uric acid regularly through the metabolic process of breaking down purines. Purines can be produced alone but it can also be obtained from external factors. Patients with advanced uric acid will experience arthritis that occurs very quickly in a short time. Sufferers sleep without any symptoms, but when they wake up in the morning they feel so bad that they cannot walk. If this disease process continues, it can affect other joints, namely the wrists, knees, feet or elbows.

Uric acid is a nitrogen compound produced from the process of breaking down purine catabolism both from the diet and from endogenous nucleic acids DNA. Uric

acid is mostly excreted through the kidneys and only a small part through the digestive tract [17].

Purines themselves are derivatives of proteins contained in the body. Purines are also obtained from the food consumed. Purines are metabolized in the body to uric acid by the enzyme adenosine diaminase. Then uric acid will be metabolized again into water-soluble allation by the enzyme uricase. However, in humans, this enzyme is very small so that the end product of purines is uric acid. When uric acid levels are higher and exceed saturation levels in the body, uric acid will gradually precipitate and crystallize [7].

Uric acid is the result of metabolism in the body whose levels should not be excessive, everyone has uric acid in their body, because every normal metabolism will produce uric acid while the trigger is dietary factors and other compounds that contain lots of purines. Purines are found in all foods that contain protein. It is absolutely impossible to get rid of all protein-containing foods. A low purine diet also limits fat, because fat tends to limit uric acid excretion. If gout sufferers do not go on a low-purine diet, there will be a buildup of uric acid crystals in the joints and even in the kidneys which can cause kidney stones.

Uric acid binds or dissolves more easily in urine than water, possibly due to the presence of urea, protein, and mucopolysaccharides. Its solubility is strongly influenced by the pH of the urine itself. At a pH of 5.0 the urine becomes more saturated with uric acid at concentrations ranging from 360 to 900  $\mu\text{mol/L}$  (6 to 15 mg/dL). At pH 7.0 saturation is reached with concentrations of between 158 and 200 mg/dL. The ionized form of uric acid in the urine is mono and disodium, calcium, ammonium and calcium urate [18].

Uric acid is classified as a disease that occurs due to disturbances in purine metabolism. This disorder causes high levels

of uric acid in the blood which then easily crystallizes due to imperfect purine metabolism. The formation of monosodium urate crystals (MSU) plays an important role in the initial process of a gout attack. Crystallization of uric acid often occurs in the joints, tendons, cartilage and membranes and the kidneys. In a more severe stage, the buildup of uric acid crystals will form tofus. These crystal deposits will become inflamed when triggered by several factors including stress, impact and cold temperatures [3].

High uric acid levels, commonly referred to as hyperuricemia, in the blood are more than 7 mg/dL in men and more than 6 mg/dL in women. Prolonged hyperuricemia can damage joints, soft tissues and kidneys. Hyperuricemia usually does not show asymptomatic symptoms. This hyperuricemia occurs due to increased production of uric acid or decreased excretion in the body [21].

Blood uric acid levels differentiated according to age and gender. Before experiencing puberty, uric acid levels in boys and girls average 3.5 mg/dL. After puberty uric acid levels in boys increase gradually and can reach 5.2 mg/dL, whereas in girls it usually remains low because they have the hormone estrogen which can excrete uric acid from the body. Usually uric acid levels in women begin to show an increase in the postmenopausal period and can reach 4.7 mg/dL. Normal uric acid levels in adult males are 3.4-7.1 mg/dL and in adult females 2.5-6.0 mg/dL. Uric acid circulating in the blood will not cause disease if the levels are within normal limits [25].

Purine metabolism in the human body can produce a product that is produced through the process of overhauling purine nucleic acids in the body and is present in food and drinks. The end product of purine metabolism is uric acid. Uric acid which is broken down by bacteria in the form of ions and  $\text{NH}_3$  (ammonia) in the intestine is 18-20% which will then be excreted through the feces. Xanthinioxidase is an enzyme that has

an important role in uric acid synthesis. This enzyme is very active in the kidneys, liver and appendix, without this enzyme uric acid cannot be formed [16]

Examination of Uric Acid Examination of blood uric acid levels in the laboratory can be done in 2 methods, namely the fast method using a stick and the enzymatic method.

1. Examination of uric acid levels using a stick can be done using the UASure Blood Uric Meter. The test strip is designed in such a way that when blood is dropped on the reaction zone of the strip, a uric acid catalyst triggers the oxidation of uric acid in the blood. The intensity of the electrons formed is measured by the sensors of UASure and is proportional to the concentration of uric acid in the blood. The principle of checking the tool is UASure Blood Uric Acid Test Strips using a catalyst combined with biosensor technology that is specific for measuring uric acid. Uric acid concentration in blood [24].
2. The enzymatic method is uricase breaking uric acid into allantoin and hydrogen peroxide. Furthermore, in the presence of peroxidase, peroxide, Toos and aminophenazone to form quinoneimine color. The intensity of the red color formed is proportional to the concentration of uric acid. Reference value for men: 3.4 – 7.0 mg/dl, while for women: 2.4 – 5.7 mg/dl.

The principle of uric acid is oxidized by uricase to allantoin with H<sub>2</sub>O<sub>2</sub> in the presence of peroxidase to produce a colored chromogen which is measured at a wavelength of 546 nm which is proportional to the acid content in the sample.

In serum, urate is in the form of sodium urate, while in the urinary tract, urate is in the form of uric acid. In normal humans, 18-20% of lost uric acid is broken down by bacteria into CO<sub>2</sub> and ammonia (NH<sub>3</sub>) in the

intestine and excreted in the feces. Uric acid can be absorbed through the intestinal mucosa and excreted through the urine.

In humans, most of the purines in the nucleic acids that are eaten are directly converted into uric acid without first being combined with the body's nucleic acids. An important enzyme that plays a role in the synthesis of uric acid is xanthine oxidase. This enzyme is very active in the liver, small intestine, and kidney. Without the help of this enzyme, uric acid cannot be formed [22].

Decreased estrogen levels play an important role in the pathogenesis of various diseases, one of which is gout. Hormonal decline is affected by age. Reducing the hormone estrogen results in a high risk of developing osteoporosis, especially during menopause because the hormone estrogen decreases resulting in a decrease in bone mass [5].

Uric acid is excreted from the body through digestion and kidneys. The digestive tract excretes about 20-30% uric acid. Excretion of uric acid in the normal human body has an average of about 400-600 mg/hour. Absorption and secretion of sodium in the kidney is influenced by natural compounds and pharmacological compounds. Decreased uric acid excretion is caused by a variety of conditions that can result in nephrogenic retention of uric acid.

Decreased organ function is a health condition caused by age. In addition, decreased organ function can also occur due to a history of underlying disease. Along with decreased organ function, the risk of degenerative diseases will increase. Degenerative diseases that often occur in the elderly include hypertension or high blood pressure, gout, obesity, diabetes mellitus and others.

The relationship between gout and the elderly is that uric acid is the end product of the body's metabolism. Uric acid will not be accommodated in its entire metabolism resulting in high levels of uric acid in the

blood which is called hyperursemia. Generally, this disease will attack the elderly. A person is said to be elderly if he is over 60 years old. So the elderly often face health problems due to physical deterioration, weakness in organs resulting in various diseases such as increased uric acid levels which cause diseases such as kidney stones and rheumatism. This disease can cause joint disorders,

Point of Care Testing (POCT) research or also called Bedside Test is defined as a medical examination that is carried out near or beside the patient's bed. Not only uric acid that can be checked on a POCT tool, but there are several tests that can be checked by a POCT tool, including blood sugar checks, urine dipstick tests, pregnancy tests, blood gas and electrolyte analysis, rapid coagulation tests, drug screening, cholesterol and others [6].

The use of the POCT tool in examining uric acid levels is allowed only for monitoring and can be done anywhere and anyone can use it, but if to make a diagnosis on uric acid examination, a tool with a more specific method is needed. The disadvantage of this method is that the examination material is in the form of whole blood, so that if the hematocrit level of the examination material is higher, the amount of serum that will be obtained will be less. Uric acid is distributed to blood plasma, so a small amount of serum examination material can reduce uric acid levels on examination results [15].

The POCT auto check tool is designed to quantitatively measure the levels of substances in the blood. The POCT auto check tool consists of a meter, code chip and strip. So to ensure the accuracy of the tool's work, every time you use a test strip from a new packaging tube, the code chip must be replaced, because each code chip packaging is different.

The principle of the POCT accu check tool is reflectance which is defined as the

ratio between the total amount of radiation given to the surface. The principle used by POCT is to read the color formed from a reaction between a sample containing certain chemicals and the reagents in a test strip. The reagents contained in the test strip will produce a color with a certain intensity which is directly proportional to the levels of chemicals present in the sample. If the color has been formed, the tool will read it from the bottom of the strip.

## RESEARCH METHODS

The study used a quantitative approach which described the results of uric acid examination in the elderly using the Point Of Care Testing (POCT) method at the North City Health Center. The type of research used is descriptive research with a quantitative approach, because quantitative research is research that places more emphasis on information in the form of numbers, these numbers can represent variables. The aim is to find out and determine the description of uric acid levels in the elderly at the North City Health Center.

The type of data used in this study, namely the type of primary data and secondary data. The primary data in this study were the results of a uric acid examination carried out at the North City Health Center. Secondary data, namely data from related journals, other supporting data, uric acid data from the Community Health Center and distribution of questionnaires. Sources of data obtained from the results of uric acid examination and questionnaires.

The population in this study were 60 elderly people who were treated and checked for uric acid levels at the North City Health Center. The sample of this research is some sufferers Gout at the North City Public Health Center, namely 31 samples. The sample size in this study uses the proportion estimation sample size formula.

The sampling technique used in this study was purposive sampling based on inclusion and exclusion criteria.

Data analysis is the process of processing data that is carried out after collecting data. Data were analyzed using univariate analysis. Univariate analysis with a descriptive test, namely data analysis techniques on one variable and each variable is analyzed without being associated with other variables, univariate analysis aims to explain the characteristics of each research variable [11].

## RESEARCH RESULT

Based on research that has been carried out with an overview of uric acid levels in the elderly in the working area of the North City Public Health Center which began on November 14-23 2022 on 31 suffering from gout cases. The patient's capillary blood was taken to check uric acid levels using the POCT tool.

**Table 1.** Frequency Distribution Based on Examination Results

Check up result	Frequency	Percentage (%)
Normal	13	41.9
Tall	18	58.1
Total	31	100%

Source: Primary Data, 2022

Table 1 shows that of the 31 respondents whose uric acid levels were checked using the Autocheck tool, there were 18 (58.1%) respondents with high uric acid levels and 13 respondents with a percentage (41.9%) who had normal uric acid levels.

**Table.2** Frequency Distribution Based on Gender

Gender	Results		f	%
	Normal	High		
Man	7	8	15	48.4
Woman	5	11	16	51.6
Total			31	100%

Source: Primary Data, 2022

Based on table 2, it shows that of the 31 respondents whose uric acid levels were checked using the auto-check tool, 16 (41.9%) were female, with high uric acid levels, 11 people and normal, 5 people, while those who were male as many as 15 respondents (48.4%) with high uric acid levels were 8 people and who had normal uric acid levels were 7 people.

**Table 3.** Frequency Distribution Based on Patient Age

Patient Age	Male Female		f	%
60-65	9	8	17	54.84
66-69	3	4	7	22.58
70-74	3	4	7	22.58
Total			31	100%

Source: Primary Data 2022

Based on table. 3 it shows that of the 31 respondents who examined uric acid levels, they were divided into three, namely respondents who were 60-65 years old with 9 men and 8 women out of a total of 17 respondents with a percentage (54.84 %), then aged 66-69 years with 3 men and 4 women out of a total of 7 respondents with a percentage (22.58%), and at the age of 70-74 years with 3 men and women 4 people out of 7 respondents with a percentage (22.58%).

## DISCUSSION

Elderly is a person whose age is more than 60 years and over who experiences physical and physiological and social changes. These changes will affect aspects of life including health. Biologically, the elderly population is a population that experiences a continuous aging process which is characterized by a decrease in the body's resistance, which makes it more susceptible to various disease attacks that can result in death. This is due to changes in the structure and function of cells, tissues and organs [3].

Uric acid is a compound that is difficult to dissolve in water which is the end product

of purine metabolism. Purines are a group of chemical structures that make up DNA. When DNA is destroyed, purines are catabolized. Uric acid is an additional product of normal metabolic results from the digestion of food proteins that contain purines. Purines are organic base compounds that make up nucleic acids and are included in the group of amino acids that make up proteins. The more purines in the body, the more the body produces uric acid or uric acid [2].

Excess purines will usually be cleaned by the kidneys and excreted from the body along with urine. However, uric acid levels can continue to build up if the kidneys are not effectively removing uric acid or when the body continues to produce large amounts. Excess purine levels will flow in the blood which will then convert uric acid into crystals. The longer the crystals will accumulate around the joints and other soft tissues of the body which will cause joints and muscles to feel sore [1].

In viewing or examining uric acid levels in the elderly, researchers first made observations of the elderly who were at the North City Health Center. Then the researcher meets with the patient asking whether the patient is willing to take samples that will be examined by the researcher, if the patient agrees or is willing to be sampled then the researcher will provide a questionnaire which will be filled in by the patient besides that the researcher will also provide the consent attachment to be signed as proof that the patient really agrees to have the sample taken as research material.

After examining uric acid levels in the elderly using the POCT method at the North City Health Center, Gorontalo City. Of the 31 samples that were examined, 18 people obtained high uric acid levels with a percentage (58.1%). Meanwhile, normal uric acid levels were 13 people with a percentage (49.9%).

This is common because uric acid will increase when a person's age increases and the habit of frequently consuming foods that contain high purines can often increase uric acid levels in the blood. Most of these purines come from food, especially meat, alcohol and some types of vegetables and nuts.

The main complaint that is often felt by sufferers is feeling pain and often experiencing stiff joints. Normal uric acid levels in the blood in men are 3.5-7.2 mg/dl and women are 2.6-6.0 mg/dl when this compound accumulates in amounts above normal, it will trigger the formation of crystals that form like needles. This disorder causes high levels of uric acid in the blood which then easily crystallizes due to imperfect purine metabolism.

This is in line with a study conducted on 35 patients, the results showed that 20 patients who were older tended to have higher uric acid levels. This illustrates that high uric acid levels generally occur at an older age. The biggest change that occurs in old age is the loss of body mass, including bone, muscle, and organ mass, while fat mass increases. The aging process causes disturbances in the formation of the enzyme hypoxanthine guanine phosphoribosyl transferase due to decreased hormone quality. This enzyme is very influential in converting purines into purine nucleotides. If this enzyme is deficient, the purines in the body will increase [15].

Based on gender shows that Of the 31 respondents whose uric acid levels were examined using the POCT method, 16 were female (51.6%) more, while 15 were male (48.45). In this gender category, 11 people with high uric acid levels were found in women and 5 normal people, while 15 (48.4%) men with high uric acid levels were 8 people and those who had normal uric acid levels as many as 7 people.

women have an estrogen hormone which with age this hormone will experience a

decrease in function so that it can increase various diseases. Decreased estrogen levels play an important role in the pathogenesis of various diseases, one of which is gout. Hormonal decline is affected by age. Reducing the hormone estrogen results in a high risk of developing osteoporosis, especially during menopause because the hormone estrogen decreases resulting in a decrease in bone mass [9].

This is in line with Rokhima's research (2020) which found the results of the study that the majority of respondents who had high uric acid levels were female, as many as 38 respondents (69%) with details of low uric acid levels 0 respondents, normal 2 respondents as high as 32 respondents, while 15 respondents (31%) were male with high uric acid levels. The comparison between the number of men and women who check uric acid levels is influenced by the lack of knowledge of the elderly, especially the elderly who are female regarding consumption of foods with high purine levels. [16].

Based on the patient's age category, the highest uric acid level was 11.0 mg/dl found in the elderly aged 66 years, while the lowest uric acid level was 3.4 in the elderly aged 60 years. Respondents aged 60-65 years with a total of 17 respondents (54.84), and aged 66-69 years with a total of 7 respondents (22.58%), and with a total of 7 respondents (22.58) have an age range of 71 -75 years. This shows that as a person ages, uric acid levels will increase. This also illustrates that high uric acid levels generally occur at a higher age. The biggest change that occurs in old age is the loss of body mass including bones, muscles and organs in the body. In the aging process it can cause disturbances in the formation of HGRT enzymes due to decreased hormone quality.

research based on age category where the highest uric acid examination result was 9.4 mg/dl which was found in the elderly 79 years and who had the lowest uric acid level

which was 5.1 mg/dl which was found in the elderly 60 years. This is also supported by research on gout where out of 54 patients there were as many as 41 people who were older tended to have higher uric acid levels. Another study stated that the proportion of respondents aged >40 years had higher blood uric acid levels, namely 69.8%, compared to respondents aged less than 40 years, namely 30.2% [10].

The relationship between gout and the elderly is that uric acid is the end product of the body's metabolism. Uric acid will not be accommodated in its entire metabolism resulting in high levels of uric acid in the blood which is called hyperursemia. Generally, this disease will attack the elderly. A person is said to be elderly if he is over 60 years old. So the elderly often face health problems due to physical deterioration, weakness in organs resulting in various diseases such as increased levels of uric acid which cause diseases such as kidney stones and rheumatism. This disease can cause joint disorders,

## CONCLUSION

From the results of examining uric acid levels in the elderly using POCT at the North City Health Center, Gorontalo City in November 2022, out of a total of 31 samples, 13 samples (49.9%) had normal examination results and 18 samples showed high results with a percentage (58.1%). Then there were 16 women (51.6%) and 15 men (48.4%).

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