Erica Gilda Misnawati dkk (Description of Pre-Hemodialysis Serum Phosphate in Late-Stage Kidney Disease Patients of Productive Age (15-64 Years) at the Indonesian Christian University General)

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Original Research Article

Description of Pre-Hemodialysis Serum Phosphate in Late-Stage Kidney Disease Patients of Productive Age (15-64 Years) at the Indonesian Christian University General Hospital

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ABSTRACT

In Indonesia, end-stage kidney disease is still a health problem that needs attention. End-stage kidney disease or abbreviated as PGTA reflects the fifth stage of chronic kidney disease, at this stage, there is a buildup of toxins, fluids, electrolytes, and the remains of the body's metabolism. In stage 5 chronic kidney disease, the glomerular filtration rate decreases < 15 ml/minute / 1.73 m^2 and has occurred for 3 months or more. One of the clinical complications of end-stage renal disease is an increase in phosphate levels in the patient's blood serum (hyperphosphatemia), this occurs due to disruption of the kidney's phosphate excretion function. Hyperphosphatemia in PGTA patients can result in hyperparathyroidism, soft tissue, and cardiovascular calcification, and affect bone mineral disorders. In kidney disease patients with a glomerular filtration rate < 30 ml/minute / 1.73m^2, the prevalence of hyperphosphatemia complications increased to 23%. This study aims to determine the description of pre-hemodialysis inorganic phosphate levels in the serum of PGTA patients of productive age (15-64 years) undergoing hemodialysis at the Indonesian Christian University General Hospital for the period January 2022. The research conducted was a descriptive study, to determine the description of phosphate levels serum of PGTA patients. The data used in this study is primary data by directly taking the blood of 20 pre-hemodialysis patients with end-stage kidney disease and then examining it in the laboratory. In this study, the results showed that 10 PGTA patients (50%) experienced an increase in serum inorganic phosphate levels above normal (>5 mg/dl). Meanwhile, 9 people (45%) had normal serum phosphate levels (2.5 - 5 mg/dl), and 1 other person had below normal serum phosphate levels (<2.5 mg/dl).

Keywords: Inorganic Phosphate, Hemodialysis, Hyperphosphatemia, End Stage Renal Disease

INTRODUCTION

Chronic kidney disease is a pathophysiological condition associated with a decrease in glomerular filtration rate and normal kidney function over several months or years. Chronic kidney disease is still a health problem for people around the world. In 2016, from the results of a systematic review and meta-analysis, Hill et al recorded the incidence of CKD in the world at 13.4%. The increase in the number of elderly people

and people suffering from diabetes mellitus and hypertension is accompanied by an increase in the prevalence of chronic kidney disease [1]. Globally, in 2017, 1.2 million people died from chronic kidney disease. Around 2.5 million people are receiving kidney replacement therapy and this is predicted to double by 2030 [2]

Chronic kidney disease is interpreted as kidney damage lasting more than 3 months and is accompanied by a decrease in kidney function as measured by the glomerular filtration rate [3]. Chronic kidney failure also refers to the condition of a significant reduction in the number of normal nephrons due to irreversible damage and is usually consistent with the disease. chronic kidney stage 3-5. In chronic kidney disease stages 3-5 the glomerular filtration rate is <60 ml/min/1.73 m2. End-stage kidney disease reflects stage 5 of chronic kidney disease, at this stage, there is a buildup of toxins, fluids, electrolytes, and waste from the body's metabolism [4].

In chronic kidney disease, complications can occur which include anemia due to lack of production of the hormone erythropoietin and iron deficiency, risk of cardiovascular disease, as well as bone disease and blood vessel calcification disorders due to mineral metabolism disorders such as low calcium and high phosphate levels. Phosphate retention and low ionized calcium will stimulate excessive production of parathyroid hormone, resulting in hyperparathyroidism. Hyperparathyroidism in chronic kidney disease can worsen the patient's bone disease condition. In patients with chronic kidney disease, homeostatic disorders can also be found, such as prolonged bleeding time, impaired platelet aggregation and adhesion [3,4].

In chronic kidney disease, there is a buildup of materials or substances that are normally excreted by the kidneys, such as a buildup of fluids, and electrolytes such as phosphates and toxins {4.5}. The buildup of these substances in the body can lead to death unless they are removed from the body by dialysis therapy or dialysis {4.6}. The most common cause of hyperphosphatemia is kidney failure, this is due to reduced kidney excretion function for phosphate. Hyperphosphatemia is also influenced by excess dietary phosphate and the release of phosphate from cells [7]

Based on the information written above and also the large number of cases of hyperphosphatemia in patients with chronic kidney disease, the author was motivated to research the picture of serum phosphate in patients with end-stage kidney disease at RSU UKI in 2022.

MATERIALS & METHODS

Types of Research

The type of research used by researchers is descriptive by taking patient blood to know the picture of serum phosphate in end-stage kidney disease patients of productive age at UKI RSU in January 2022.

Time and Place of Research

Research Time

This research was conducted in January 2022.

Research Place

The research was conducted in the hemodialysis section and laboratory at the Indonesian Christian University General Hospital.

Research Population and Sample

Research Population

The population in this study was all patients with end-stage renal failure at RSU UKI in the hemodialysis section, totaling 60 people.

Research Sample

The samples taken in this study were sufferers of end-stage kidney failure of productive age, taken using a purposive sampling technique, namely the entire population determined by the researcher was the research sample. The sample in this study was 20 people. According to Gay, Mills, and Airasian, research using descriptive methods usually requires a minimum sample of 10% of the population.

Write here the procedure/technique of your research study.

Sample Criteria

The sample criteria consist of 2, namely inclusion criteria and exclusion criteria. Inclusion criteria are criteria that will be included in the sample, while exclusion criteria are criteria that will be excluded from the sample.

Inclusion Criteria

The inclusion criteria in this study are:
1. Patients with end-stage renal failure in the period January 2022 at RSU UKI
2. Have compos mentis awareness
3. Willing to be a respondent

Exclusion Criteria

The exclusion criteria in this study are:
1. Patients with acute renal failure
2. Patients with chronic renal failure who have never undergone hemodialysis
3. The patient is not of productive age
4. Not willing to be a respondent

Research Variables
Independent Variable (independent variable)

Independent variables are variables that influence or can provide changes to the dependent variable. The independent variables in the study were the patient's diet pattern (food containing phosphate), and history of use of phosphate-binding drugs.

Dependent Variable (dependent variable)

The dependent variable is a variable that is influenced by the independent variable. The dependent variable in the study was serum phosphate levels

Data Collection Methods

The type of data in the research is primary data. Primary data is data obtained directly from sources. Data on serum phosphate levels was obtained by taking blood from patients with end-stage kidney disease and then measuring serum phosphate levels in the laboratory.

Research Stages
1. Preparation of a research proposal with the title Description of Serum Phosphate in End-Stage Kidney Disease Patients of Productive Age at RSU UKI in January 2022
2. Submit a proposal to the dean's secretary to obtain an introductory letter of ethics for taking medical records.
3. Collect data from patients suffering from end-stage kidney disease in the period January 2022.
4. The data taken was then tabulated and processed using the Microsoft Office Excel computer application.

Data Processing and Analysis
Editing

Check the completeness of the data obtained, then all data is edited using the Microsoft Office Excel computer application program. The editing results showed that all data was filled in completely.

Tabulating

Grouping data into tables for analysis, all data obtained was entered into the Microsoft Office Excel computer application program.

Data Analysis

Analyze the data obtained using the Microsoft Office Excel application.

RESULT

After data collection was carried out in the hemodialysis room and laboratory room at RSU UKI on January 24 2022. In chapter IV the author will present research data that has been analyzed using the Microsoft Office Excel software program. The data used is primary data obtained by taking blood serum from hemodialysis patients to check their serum phosphate levels. The samples taken in this study were patients with kidney failure in the final stages of productive age, taken using a purposive sampling technique, that is, the entire population determined by the researcher was the research sample. The sample in this study was 20 people with a population of 60 people.

Research Results

1. Description of PGTA Patients at RSU UKI Based on Gender

Table 1 Frequency of PGTA Patients Based on Gender

Gender	Frequency	Percentage (%)
Male	14	70
Female	6	30
Total	20	100

The data in Table 1 is presented in the form of a pie chart as in Figure 1 below:
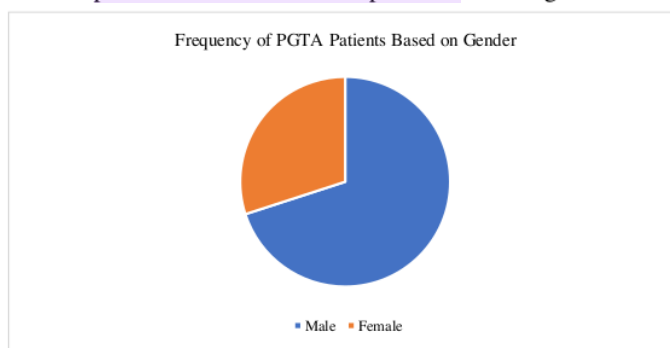
Figure 1. Pie Chart of Frequency of PGTA Patients Based on Gender

The description of PGTA patients at RSU UKI who were sampled in the study based on gender shows that there were 14 patients (70%) who were men and 6 patients (30%) who were women.

2. Description of PGTA Patients at RSU UKI Based on Age Group

Table 2. Frequencies of PGTA Patients Based on Age Group

Age	Number of Patients	Percentage (%)
37-41	1	5
42-46	3	15
47-51	1	5
52-57	5	25
58-62	8	40
63-67	2	10
Total	20	100

The data in Table 2 is presented in the form of a pie chart as in Figure 2 below:
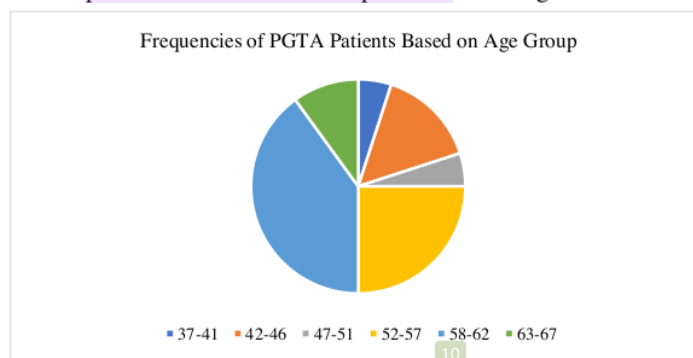

Figure 2. The Diagram Pie of Frequencies of PGTA Patients Based on Age Group

The description of PGTA patients at RSU UKI based on age group showed that of the 20 total samples, the largest percentage of PGTA patients came from the 58-62 age group, namely 8 people (40%). There were also 1 patient in the age group 37-41 and 47-51, 2 people in the age group 63-67, 3 people in the age group 42-46, 5 people in the age group 52-57

3. Description of PGTA Patients at RSU UKI Based on Disease Cause

Table 3 Frequencies of PGTA Patients Based on Causing Disease

Causes of PGTA	Frequency	Percentage
Diabetes Mellitus	11	55%
Hypertension	12	60%
Gout	1	5%

From the research conducted, data was obtained that hypertension was the disease causing PGTA with the largest percentage, namely 12 patients (60%), while the cause with the smallest percentage was gout with 1 patient (5%).

4. Description of PGTA Patients at RSU UKI Based on History of Phosphate Binder Drug Consumption

Table 4 Frequencies of PGTA Patients Based on Use of Phosphate Binder Drugs

Type of Medicine	Frequency	Percentage (%)
$CaCO_3$	20	100
Total	20	100

All PGTA patients who were willing to be sampled in the study had a history of consuming phosphate-binding drugs, namely $CaCO_3$ with the brand name Calos

5. Description of PGTA Patients at RSU UKI Based on Serum Phosphate Levels

Table 5 Frequencies of PGTA Patients Based on Serum Phosphate Levels

Inorganic Phosphate Levels	Frequency
Increased Phosphate Levels (>5 mg/dl)	10
Normal Phosphate Levels (2.5 - 5 mg/dL)	9
Low Phosphate Levels (<2.5 mg/dL)	1
Total	20

From the table and figure above, it can be seen that of the 20 samples of PGTA patients examined, around 50%, namely 10 patients experienced hyperphosphatemia or serum inorganic phosphate levels that increased above 5 mg/dl, while 9 patients had normal serum phosphate levels and 1 patient had a serum phosphate level below normal.

DISCUSSION
1. Description of PGTA Patients at RSU UKI Based on Gender

From the data in Table 1, we can see that of the 20 patients with end-stage renal disease on hemodialysis, 70% were male patients, while the other 30% were female. This higher percentage of male patients is also following data released by the eleventh edition of the Report of the Indonesian Renal Registry. The data states that the percentage of new hemodialysis patients in 2018 was dominated by male patients (57%) while the percentage of female patients was (43%), this data is also following the description of hemodialysis patients in several other countries. 30 Male gender- Men are also one of the predisposing factors that influence the occurrence of PGTA, this is because gender is related to type of work, habit of consuming energy supplement drinks, alcohol, smoking habits, diet patterns, and so on [11,12].

In contrast to the data obtained by the author, from the results of a meta-analysis and systematic review conducted by Hill et al in Global Prevalence of Chronic Kidney Disease, it was found that the prevalence of chronic kidney disease is higher in women than men [13].

2. Description of PGTA Patients at RSU UKI Based on Age

Based on the results of research conducted by the author, the percentage of patients with end-stage renal disease is dominated by patients from the 58-62 age group, namely 8 people (40%) out of 20 samples. This data is strengthened by the theory that the structural anatomy and function of the kidney will change along with the aging process. At the age of over 30 years, changes will occur in the kidneys in the form of renal atrophy, and the thickness of the renal cortex will decrease by 10% per decade. As age increases, the risk of glomerulosclerosis increases, this is due to changes in the form of increased thickness of the glomerular basement membrane and accumulation of extracellular proteins. Apart from that, in adults there is an increase in the incidence of hypertension and also diabetes mellitus, which is one of the causes of the disease chronic kidney disease [1].

3. Description of PGTA Patients at RSU UKI Based on History of the Cause

Based on the results of data on previous medical history which is the cause of end-stage kidney disease, it was found that hypertension was the cause with the largest percentage (60%), namely 12 people out of 20 samples. Diabetes mellitus was the second cause with a percentage (of 55%) of 11 patients and gout with a percentage (5%) of 1 patient. This data is also supported by data from the 11th edition of the Report of the Indonesian Renal Registry in 2018. In this data, the etiology of stage 5 chronic kidney disease is dominated by patients who have a history of hypertension, namely 19,427 people (36%) [20]. This is due to the occurrence of glomerulosclerosis in hypertensive patients, due to increased strain and pressure on the arterioles and glomeruli over the long term, resulting in sclerosis. Meanwhile, the etiology in second place is diabetic nephropathy, amounting to 14,998 people (28%) [10].

According to the Indonesian Renal Registry report in 2017, data was obtained that the order of etiology of stage 5 chronic kidney disease from the highest value was hypertensive kidney disease 36%, diabetic nephropathy 29%, primary glomerulonephropathy 12%, chronic pyelonephritis 7%, obstructive nephropathy 4%, systemic lupus erythematosus 1%, uric acid nephropathy 1%, polycystic kidney 1%, others 8%, and unknown 1% [12].

4. Description of PGTA Patients at RSU UKI Based on History of Phosphate Binder Drug Consumption

From the data in the table above, the author found that there was a history of using phosphate-binding drugs in all patients in the research sample, namely 20 samples (100%). The phosphate binding drug used is calcium carbonate with the trademark Calos 500 mg. The way calcium salts (calcium carbonate) work as a phosphate binder is, in the digestion of medication calcium carbonate will be split into calcium ions and also carbonate ions, the carbonate ions will be absorbed into the blood, while the calcium ions will work as a phosphate binder in digestion and will be excreted. with feces.36 Some examples of other phosphate-binding drugs are (sevelamer, calcium acetate, and aluminium hydroxide) [4].

5. Description of PGTA Patients at RSU UKI Based on Serum Phosphate Levels

From the data obtained by the author, 10 PGTA patients (50%) experienced an increase in serum inorganic phosphate levels above normal (>5 mg/dl). Meanwhile, 9 people (45%) had normal serum phosphate levels (2.5 - 5 mg/dl), and 1 other person had below normal serum phosphate levels (<2.5 mg/dl). This data is also supported by data in Table 1 which states that in chronic kidney disease patients with GFR <30 ml/minute/1.73 m2 the prevalence of complications in the form of hyperphosphatemia increases to 23% [20]. Hyperphosphatemia in PGTA patients occurs due to reduced kidney function which can no longer excrete excess phosphate in the body properly. Hyperphosphatemia in PGTA patients can result in hyperparathyroidism,

soft tissue, and cardiovascular calcification, and affect bone mineral disorders. These things make hyperphosphatemia one of the main risk factors for mortality in PGTA patients, but this can be changed with appropriate management [18].

One of the treatments for hyperphosphatemia is limiting phosphate intake and eating high-protein foods, as in the data in Table 3. In managing this dietary pattern, regular assessments of the patient's nutrition are also required [19]. From the results of the author's brief history of patients, it was found that the majority of patients have the habit of consuming foods containing high phosphorus and protein (fish, chicken, nuts, eggs, and so on). Apart from that, phosphate levels in the body of PGTA patients are also influenced by phosphate intake and absorption, the patient's pharmacological therapy (phosphate binders), and hemodialysis [3].

CONCLUSION
Based on the results of the research conducted, it was concluded that:

1. PGTA patients undergoing hemodialysis at RSU UKI have more male patients than female patients. This is the same as research in other places where there are more men due to factors related to the type of work, the habit of consuming energy supplement drinks, alcoholic drinks, smoking habits, diet patterns, and so on.

2. PGTA patients undergoing hemodialysis at RSU UKI mostly occur in the 58-62 age group (40%), the aging process causes changes in the histological structure of the kidneys and a decrease in kidney function.

3. In PGTA patients undergoing hemodialysis at RSU UKI, the highest history of previous disease underlying PGTA is hypertension with a percentage (60%), and in second place is diabetes mellitus. This is also following data from the 2018 eleventh edition of the Report of the Indonesian Renal Registry.

4. In PGTA patients undergoing hemodialysis at RSU UKI, the most frequent data regarding the serum phosphate profile was hyperphosphatemia (>5mg/dl), namely 10 patients (50%) out of 20 samples. Meanwhile, 9 people (45%) had normal serum phosphate levels (2.5 - 5 mg/dl), and 1 other person had a serum phosphate level below normal (<2.5 mg/dl).

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