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The incidence rate of urinary tract stones in inpatients at the UKI General Hospital in 2015–2016

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Abstract
This study is the description that aims to characteristics of urinary tract stones in patients hospitalized in the UKI General Hospital. The population of this research is all medical records of inpatients in UKI General Hospital in 2015-2016. The data were taken from patient records in hospitals based on inclusion and exclusion criteria. The results obtained are: distribution of most age groups aged 45-54 years (34.2%), the dominant male gender (68.5%), private jobs with the highest frequency (63%), history of diabetes type 2 (15.1%), history of hypertension (30.1%), accompanied by a urinary tract infection (31.5%), and based on the doctor's diagnosis of kidney stones obtained (21.9%), ureteral rocks (21.9%), bladder stones (13.7%), urethral stones (4.1%), hydronephrosis (19.2%), and renal colic (19.2%). It is expected that Kristen Indonesia University Hospitals can improve health care by educating the patient in the case that factors into a person's risk of urinary tract stones to reduce the frequency or the number of patients with urinary tract stones.

Keywords: urinary tract stones, age, sex, urinary tract infection, diabetes mellitus type–2

Introduction
Urinary tract stone disease, from now on will be abbreviated as UTS, is the formation of stones caused by the deposition of substances contained in the urine in excessive amounts or due to other factors that affect the substance's solubility. Since ancient times, humans have suffered UTS; this is evidenced by the known presence of urinary tract stones in Egyptian mummies dating from 4800 years BC. The father of medicine, Hippocrates, wrote four centuries BC about kidney stones with kidney abscesses and gout [1]. The kidney stones prevalence in Indonesia ranges from 0.1% to 1.2%, with an average of 0.6% [2]. Intrinsic and extrinsic factors influence the formation of UTS. Intrinsic factors are heredity, age and gender, while extrinsic factors are geography, climate and weather factors, amount of water consumed, diet/diet, occupation, obesity, and diabetes [3]. UTS recurrence rate in one year is 15-17%, 4 -5 years 50%, ten years 75% and 95-100% in 20-25 years. If UTS recurs, there can be an increase in mortality and an increase in treatment costs. UTS manifestations can take the form of mild to severe pain and complications such as urosepsis and kidney failure [4]. UTS can cause an emergency when the stone descends in the collecting system and can cause abnormalities such as renal collecting or infection in urinary tract obstruction [5]. The disorder causes pain due to dilatation of the occluded system with stretching of pain receptors and local irritation of the ureteral wall or renal pelvis wall accompanied by oedema and release of pain mediators. Recurrent attacks of colic often accompany approximately 60-70% of stones that descend spontaneously. One of the complications of urinary tract stones is impaired kidney function, marked by an increase in blood urea and creatinine levels. These disorders vary from a mild stage to the onset of uremia syndrome and kidney failure. When the situation is at an advanced stage, it can even lead to death [6]. Given many sufferers and the problems that UTS can cause, the authors are interested in studying more deeply the characteristics of UTS sufferers at the Universitas Kristen Indonesia (UKI) General Hospital in 2014 – 2016. Based on the background above, the problem answered in this study are a) What are the characteristics of patients with Urinary Tract Stones in inpatients at the UKI General Hospital in 2015 – 2016?; and b) What are the risk factors for Urinary Tract Stones in inpatients at the UKI General Hospital in 2015 – 2016?. To know the characteristics of patients with urinary tract stones in inpatients at the UKI General Hospital.

Literature Review
The anatomy of the urinary system consists of organs, namely the kidneys and the urinary tract, which consists of the ureters, bladder, and urethra. Kidneys are paired organs; one kidney weighs 120-200 g, and a normal kidney measures 10-12cm vertically, 5-7cm transversely and 3cm a.p. The outer surface can be divided into the anterior side, dorsal side, upper pole and lower pole—convex lateral surface [7]. The concave medial surface is deeply grooved (renal sinus) and forms the hilus of the kidney. Renal ureter/pelvis, renal arteries, renal blood vessels, lymphatic vessels and nerves enter or leave through the hilum of the kidney [8]. The ureter is a 22-30 cm long muscular tube connecting the renal pelvis and bladder. On radiography, the ureter is divided into three parts: a) upper third: from the renal pelvis to the upper edge of the sacrum; b) middle third: from the upper edge to the lower end of the sacrum; and c) distal third: lower the edge of the sacrum to the bladder.
There are anatomical deposits, namely: a) Uretropelvico junction, namely the proximal part of the ureter starting from the renal pelvis to the smaller ureter; b) Pelvic brim, which is a cross between the ureter and the iliac arteries; c) Vesikouretro junction, which is the end of the ureter that enters the urinary bladder (bladder). The bladder has a volume capacity of 400-500 ml and a round ovoid shape. The bladder can be divided into a body by two lateral walls: the dorsal and the abdominal walls. The dorsal and ventral walls meet at the apex, and the urachus begins and travels to

the umbilicus. The bladder neck surrounds the bladder trigone. The urethra is a narrow tube consisting of a mucous membrane with sphincter-shaped muscles at the bottom of the bladder. It is situated slightly above the internal orifice of the urethra in the bladder and extends 1.5 inches (3.75 cm) in women and 7-8 inches (18.75 cm) in men. The male urethra is divided into the prostatic part, the membranous part, and the large part.

UTS is the formation of stones caused by the deposition of substances in the urine in excessive amounts or other factors that affect the substance's solubility. The father of medicine, Hippocrates, wrote four centuries BC about kidney stones with kidney abscesses and gout [1]. The formation of urinary tract stones requires a state of supersaturation in stone formation. Stone-forming inhibitors are found in normal urine. Calcium oxalate stones with citrate and glycoprotein inhibitors [9]. Some promoters (reactants) can stimulate stone formation, such as uric acid, spurring the formation of calcium oxalate stones. The action of inhibitors and reactants is not fully known. This process is suspected of playing a role in the initial construction or nucleation of crystals, crystal progression, or aggregation. The addition of citrate in the calcium complex can prevent the accumulation of calcium oxalate crystals and may reduce the risk of crystal aggregation in the urinary tract [10]. The exact aetiology of urinary tract stones is unknown, and until now, many theories and factors have influenced the occurrence of urinary tract stones, namely physicochemical theory and matrix theory [11].

Calcium oxalate is the most common cause of urinary tract stones (70-75%). Stones consist of calcium oxalate, men - twice as often as women. The highest incidence is aged 30-50 years. Calcium oxalate stones occur because of a multifactorial process; congenital and metabolic disorders are often the causative factor [12]. Two different ones are a) Whewellite (Ca Ox Monohydrate), solid, brown/black in colour with a high concentration of oxalic acid in the urine; and b) Combination of calcium and magnesium to form weddllite (Ca Ox Dihydrate): a yellow stone, more easily crushed than whewellite, but this type has a high residif number.

Calcium oxalate stones can be analyzed through blood and urine. Disorders of calcium metabolism such as hypercalciuria and hypercalcemia or both (average> 2.5 mmol/L) often occur. Disorders of urate metabolism are a sign of calcium oxalate stone formation, so it is necessary to pay attention to urate asthma levels> 6.4 mg/100 ml. Increased excretion of oxalic acid occurs in 20–50% of patients with oxalate stones [13]. High oxalate excretion is associated with recurrent stone formation. Citrate and magnesium are essential elements that can inhibit crystallization. Low excretion of citrate increases the risk of calcium oxalate stone formation.

More than 15% of urinary tract stones with uric acid composition. Patients are usually aged from 60 years. Younger patients also suffer from obesity, and men are more often than women. Uric acid stones are formed only by uric acid. Diet is an essential risk for these stones. Diets high in protein and purines and alcoholic beverages increase the excretion of uric acid so that the pH of the urine is low. As many as 20-40% of patients with gout will form stones; therefore, high uric acid results in hyperuricosuria [14]. Uric acid stones are a type of stone that can be broken down with drugs. As many as 90% will be successful with chemolysis therapy. Blood and urine analysis on uric acid stones: uric acid >1.0 mol/dl (6.4mg/100mL), urine pH 5.8.

Two kinds of calcium phosphate stones occur depending on the pH of the urine. Apatite carbonate (dahllite) is formed at pH>6.8 with high calcium and low citrate concentration. Like calcium oxalate stones, calcium phosphate stones are also mixed and occur in the atmosphere of alkaline or infected urine simultaneously with Ca Ox or struvite. Brushite (calcium hydrogen phosphate) is formed at a urine pH of 6.5 – 6.8 with high calcium and phosphate concentrations. This stone has a hard nature and is difficult to break by lithotripsy, forming quickly with a high recurrence rate. A total of 1.5 monomineral 0.5% mixed with Ca Ox. Blood and urine analysis showed hypercalcemia (>2 – 2.5 mmol/L). The causes of renal tubular calcium oxalate stones are alkalosis and urinary tract infections. Calcium in urine> 2.5 mmol/L and urine pH > 6.8 [15]. It is caused by urinary tract infections by bacteria that produce urease (Proteus, Providentia, Klebsiella and Pseudomonas). With a frequency of 4 – 6%, struvite stones are more common in women than men. Urinary tract infections occur due to high concentrations of ammonium and urine pH >7. Under these conditions, the solubility of phosphate decreases, resulting in the occurrence of struvite stones and crystallization of carbon apatite, so that struvite stones often occur together with apatite carbonate stones. In struvite stones, large volumes of urine are essential for flushing out bacteria and reducing the supersaturation of phosphate. In addition to treating the infection, making the urine acidic with methionine is very important to prevent a recurrence. Analysis of blood and urine found urine pH> 7, also found urinary tract infections and increased urinary ammonium and phosphate levels.

Cysteine stones occur during pregnancy, caused by kidney disorders, and the frequency of occurrence is 1-2%. Reabsorption of amino acids, cysteine, arginine, lysine, and ornithine is reduced. Stone formation occurs in infancy, although most manifestations arise in the second decade. Due to heredity with autosomal recessive chromosomes, an amino cysteine, and lysine, arginine, ornithine transport disorder requires lifelong treatment [16]. Diet may cause stone formation; low urine dilution and high animal protein intake increase urinary cystine excretion. Important if urine production exceeds 3 litres/day. Alkalinization of urine by increasing the pH from 7.5 to 8 will be very useful for reducing cystine excretion with thiopurine and ascorbic acid. Blood and urine analysis showed blood cystine within normal limits. Urinary cystine 0.8 mmol/day. Calcium, oxalate and urate increase [17].

Urinary stones can occur in any part of the urinary tract. As many as 97% of urinary tract stones can be in the parenchyma, papillae, calyces, renal pelvis, and calyces and ureters. Only 3% are found in the bladder and urethra. The collecting system anatomy greatly determines the shape of the stone that occurs as an adaptation to the surrounding structure [3]. Intrinsic and extrinsic factors broadly influence stone formation. Factors that come from within the individual itself. Intrinsic factors include age, gender, heredity and family history. In contrast, extrinsic factors come from the environment outside the individual, such as geography, climate, and a person's lifestyle.

Research Method

The design of this study was retrospective descriptive

observational. The research data comes from medical records at the UKI General Hospital for the period 2015 – 2016. This research was carried out in four months, from November 2016 to February 2017, at the General Hospital of the UKI. The population of this study was the medical records of patients with urinary tract stones in inpatients at the UKI General Hospital in 2015 - 2016, which amounted to 184 patients. Sampling is 73 samples with simple random sampling. As for the flow that is passed in this research, namely: a) Prepare research proposals and ask for approval from supervisors; b) Submit an application to the secretary of the dean to obtain a cover letter for taking medical records as secondary data in thesis research; c) Complete the administration of medical record retrieval; d) Collecting data in the Medical Record Room at UKI Hospital; e) The data obtained are then tabulated using the SPSS program, and f) Data processing and analysis. The data in this study were analyzed through several processes, namely a) data entry, data editing, and tabulation. At this stage, the complete data is tabulated, then classified into each variable, then entered in a table so that it is easier to analyze and further discuss.

Result and Discussion

In this study, the total number of people living with asthma who received treatment at the UKI General Hospital during the 2015-2016 period was 184 patients' medical records. Then from 184 patients obtained 73 samples that represent the population from 73 samples received, 50 men and 23 women, the age group from youngest to oldest, occupation, body mass index, history of type-2 diabetes, history of hypertension, comorbidities with urinary tract infections, and doctor's diagnosis.

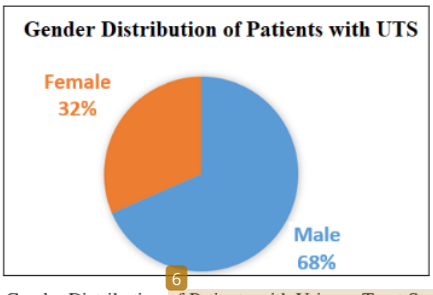

Fig 1: Gender Distribution of Patients with Urinary Tract Stones in Inpatients at the UKI Hospital in 2015 – 2016

Based on Figure 1, it was found that patients with urinary tract stones in inpatients at UKI General Hospital for the 2015-2016 period were the most men with 50 patients or 68%, while women were 23 patients or 32%.

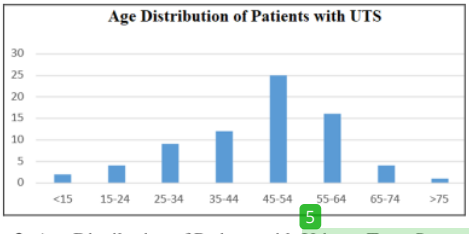

Fig 2: Age Distribution of Patients with Urinary Tract Stones in Inpatients at the UKI Hospital in 2015 – 2016.

Based on Figure 2, it is found that the age distribution of patients with urinary tract stones in inpatients at the UKI Hospital for the period 2015 – 2016 is the age group <15 years of 2 or 2.7%, the group of 15-24 years of 4 or 5.5%, the age group of 25-34 years is 9 or 12.3%, the age group of 35-44 years is 12 or 16.4%, the age group is 45-54 years is 25 or 34.2%, the age group is 55-64 years is 16 or 21.9%, 65 – 72 years at 4 or 5.5%, and the age group >75 years at 1 or 1.4%. The distribution of age groups with the lowest frequency is the age group >75 years and the highest in the age group 54-64 years.

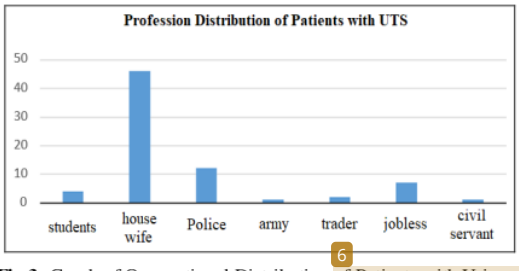

Fig 3: Graph of Occupational Distribution of Patients with Urinary Tract Stones in Inpatients at the UKI Hospital in 2015 – 2016

Based on Figure 3. it is found that the distribution of work of patients with urinary tract stones in inpatients at the UKI Hospital for the period 2015 – 2016 is 4 or 5.5% students, 46 or 63% private sector, 12 or 16.4 housewives %, police 1 or 1.4%, Traders 2 or 2.7%, jobless 7 or 9.6%, and civil servants 1 or 1.4%. The job distribution with the lowest frequency is a civil servant or police/army profession, and the highest is personal work.

Table 1: Distribution of BMI of Patients with Urinary Tract Stones in Inpatients at the UKI Hospital for the Period 2015 – 2016

Classification	Frequency	%
Thin	4	5.5
Normal	32	43.8
Overweight	28	38.4
Obesity	9	12.3
Total	73	100

Based on table 5, the distribution of the body mass index of patients with urinary tract stones in inpatients at the UKI General Hospital for the period 2015-2016 is 4 or 5.5% thin sufferers, 32 or 43.8% regular sufferers, overweight patients as many as 28 or 38.4%, and obese patients 9 or 12.3%.

Table 2: Distribution of History of Diabetes Mellitus Type – 2 Patients with Urinary Tract Stones in Inpatients at the UKI Hospital in 2015 – 2016

History of DM Type - 2	Frequency	%
Yes	11	15.1
No	62	84.9
Total	73	100

Based on table 4, the distribution of history of type-2 diabetes mellitus with urinary tract stones in inpatients at the UKI General Hospital for the period 2015-2016 was 11 or 15.1% and no history of 62 or 84.9%. It can be concluded that more patients with UTS who were hospitalized at UKI General Hospital in the 2015-2016 period did not have a history of type-2 diabetes mellitus.

Table 3: Distribution of History of Hypertension in Patients with Urinary Stones in Inpatients at UKI Hospital in 2015 – 2016

History of Hypertension	Frequency	%
Yes	22	30.1
No	51	69.9
Total	73	100

Based on table 3. the distribution of history of hypertension with urinary tract stones in inpatients at the UKI Hospital for 2015-2016 is 22 or 30.1%, and no history is 51 or 69.9%. It can be concluded that more UTS patients hospitalized at UKI General Hospital in the 2015-2016 period did not have a history of hypertension.

Table 4: Distribution of Concomitant Diseases of Urinary Tract Infections in Patients with Urinary Tract Stones in Inpatients at the UKI Hospital in 2015 – 2016

Urinary tract infection	Frequency	%
Yes	23	31.5
No	50	68.5
Total	73	100

Based on table 4, it is found that the distribution of comorbidities with urinary tract infections in patients with urinary tract stones in hospitalized patients at the UKI General Hospital for the period 2015-2016 was 23 or 31.5% UTIs and 50 or 68.5% did not suffer from UTIs. It can be concluded that more UTS patients hospitalized at UKI General Hospital in the 2015-2016 period did not suffer from urinary tract infections.

Table 5: Distribution of Diagnoses of Patients with Urinary Tract Stones in Inpatients at the UKI Hospital in 2015 – 2016

Diagnosis	Frequency	%
Kidney stones	16	21.9
Ureter stones	16	21.9
Buli stone	10	13.7
Urethral Stones	3	4.1
Hydronephrosis	14	19.2
Renal Colic	14	19.2
Total	73	100

Based on table 5, it is found that the distribution of diagnoses of patients with urinary tract stones in inpatients at the UKI Hospital for the period 2015 – 2016 is 16 or 21.9% kidney stones, 16 or 21.9% ureteral stones, 10 or 13 bladder stones. .7%, urethral stones in 3 or 4.1%, hydronephrosis in 14 or 19.2% and renal colic in 14 or 19.2%.

This study presents a description of patients with urinary tract stones in inpatients at the UKI General Hospital for the period 2015 – 2016 starting from the distribution of sex, age, occupation, body mass index, history of type-2 diabetes, history of hypertension, comorbidities with urinary tract infections, and doctor's diagnosis. In the results of gender data, it was found that more men than women suffer from urinary tract stones. The prevalence of men is 0.8% higher than women by 0.4% [19]. Based on research data at the UKI RSU inpatient for the period 2015 - 2016, it was found that patients with urinary tract stones with the highest frequency were in the 45-54 age group. The distribution of age groups with the highest frequency in patients with kidney stones is the age group of 55 - 64 years, and the results is that that most urinary tract sufferers were in adults with the highest frequency in the 31 - 60 year age group [2; 19]. Then the results of the work data show that private work is the job with the highest frequency of distribution in urinary tract stones. Based on the data obtained at the UKI General Hospital, it was found that the number of male patients was more, and almost all of them had jobs. It is in line with what Lina researched, which states that men who sit for a long time at work have a 95% chance of experiencing urinary tract stones [3].

In the body mass index data, it was found that the average patient with urinary tract stones in hospitalization at the UKI General Hospital in 2015–2016 had an average body mass index of 32 or 43.8%. However, if the number of patients who are overweight and obese is added up, the number is more than patients who have a normal BMI, which is 37 or 50.7%. Almost all patients with urinary tract stones are patients with excess body mass index and obesity. It is in line with research conducted by Taylor (2005) which said that obesity and weight gain increase the risk of kidney stone formation, significantly increasing in the female sex [20].

In the distribution of type-2 diabetes history data, 11 or 15.1% of all patients had a history of type-2 diabetes. Then in the distribution of hypertension history data, 22 or 30.1% of all patients had a history of hypertension, and 23 or 31.5% of all patients with urinary tract infections were found. From the four risk factors studied, it can be concluded that the risk of urinary tract stones being hospitalized at the UKI General Hospital is mainly associated with urinary tract infections.

Urinary tract infection (UTI) is a public health, which is caused by the frequent holding of urination. It is estimated that 10% of men and 20% of women have had a UTI. UTI can cause complications and trigger UTS [21]. In risk factors for type-2 diabetes, obesity and hypertension are associated with the formation of urinary tract stones, and diabetes is a factor in the construction of uric acid stones. Insulin resistance, a characteristic of metabolic syndrome and type 2 diabetes, results in lower urine pH through impaired renal ammonia genesis, leading to uric acid stones.

In the distribution of patient diagnoses, it was found that patients with kidney stones and ureteral stones had the highest frequency of 16 or 21.9%. It is in line with research conducted by Coll et al., who stated that the percentage of stone formation at the stone site was 48% for stones in the proximal ureter, 60% for mid-ureteric stones, 75% for distal stones, and 79% for ureterovesical junction stones [22].

Conclusion

From the descriptions that have been described previously, in this study, several conclusions can be drawn, namely: a) Based on the sex distribution of men (68.5%) than women (31.5%); b) The frequency of distribution of the most age groups receiving treatment at inpatients is the age group of 45 – 54 years (34.2%); c) Based on the occupation of patients with urinary tract stones, it was found that private work was the occupation with the highest frequency of 46 (63%); d) Based on BMI, the highest frequency in hospitalized patients is normal BMI of 32 (43.8%); e) Based on data on risk factors, 11 patients had a history of type-2 diabetes, 22 patients had a history of hypertension, and 23 patients had comorbidities with urinary tract infections; f) Based on the doctor's diagnosis, the highest frequency was kidney stones and ureteral stones with a total of 16 patients

(21.9%). Therefore, UKI must record more complete medical records, especially on the nutritional status of patients in terms of weight and height, then also on recording other risk factors such as work duration of sitting in a day, how many glasses of water are usually consumed, drug consumption or certain supplements and the dosage amount and term of use of these drugs or supplements.

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