Brawijaya Journal of Urology
July 2024, Volume 5, Issue 1
p-ISSN: 2721-4982 **e-ISSN**: 2722-4546
DOI: https://doi.org/10.11594/bjurology.2024.005.01.6

Profile of End Stage Chronic Kidney Disease due to Obstructive Uropathy Patients Undergoing Hemodialysis

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Introduction. Chronic Kidney Disease (CKD) is a condition of gradual decline in kidney function and ability caused by various kidney diseases. CKD can be caused by several conditions, including obstructive uropathy. Hemodialysis is one of the therapy options for CKD patients. The purpose of this study was to analyze the profile of CKD due to obstructive uropathy patients at Saiful Anwar General Hospital Malang, who underwent hemodialysis.
Methods. This study is a descriptive observational research with a cross sectional design, which uses secondary data taken from medical records of patients with end-stage CKD due to obstructive uropathy who undergo hemodialysis in the hemodialysis unit of Dr. Saiful Anwar General Hospital Malang, for the period of 2021-2023.
Result. Based on the gender, there were more male patients than female patients (53.13%:46.87%) were females. Hypertension comorbidity was the highest percentage, 71.88%. Based on various conditions, urinary tract stones were the highest cause of obstructive uropathy compared to other causes with a percentage of 62.5%.
Conclusion. The result showed that patients were predominantly male with comorbid hypertension. The most common cause of obstructive uropathy in this study was urinary tract stones.

Keywords: chronic kidney disease, hemodialysis, obstructive uropathy

Introduction

Chronic Kidney Disease (CKD) is a condition of severe decline in kidney function and ability that occurs slowly, caused by various kidney diseases. According to the Kidney Disease Improving Global Outcome (KDIGO), CKD is an abnormality in the structure or function of the kidneys that has been happening for more than three months, characterized by one of the following three conditions: (1) pathological abnormalities/markers of kidney damage, (2) estimated glomerular filtration rate (e-GFR) less than 60 mL/minute/1.73 m^2, or (3) post kidney transplantation. Based on Riskesdas' data of 2018, the prevalence of CKD in Indonesia is 3.8 per mil, which has increased from 2.0 per mil from 2013. Kidney disease treatment is ranked as the second largest funding, based on the Health Social Security Administration Agency of Indonesia.

CKD can be caused by several conditions. Ahmad et al. (2013) stated that the causes of chronic kidney disease were hypertension (49.1%), obstruction and infection (26.3%), polycystic kidney disease (26.3%), diabetes mellitus (17.5%), and others (31.6%). Other causes can include urinary tract obstruction. Urinary tract obstruction can occur at any age and can lead to kidney damage.

Hemodialysis is a therapy option for CKD patients to help remove toxic nitrogen substances from the blood and remove excess water. The latest statistical data shows that no less than 3700 people undergo dialysis daily [1]. In this study, an analysis of the profile of patients with end-stage chronic kidney disease due to obstructive uropathy at the Saiful Anwar Hospital in Malang who were undergoing hemodialysis was carried out.

Material and Methods

Study Design

This research is a descriptive observational research with a cross sectional study, which uses secondary data taken from medical records of patients with end-stage CKD due to obstructive uropathy who underwent hemodialysis at the hemodialysis unit at Dr. RSUD. Saiful Anwar Malang, from 2021-2023. During the research, the patient's identity was kept confidential and research permission was obtained after applying for ethical clearance from the Health Research Ethics Commission of the Faculty of Medicine, Brawijaya/RSUD Dr. Saiful Anwar Malang (289/EC/KEPK–S1–PD/10/2023).

Inclusion and Exclusion Criteria

The inclusion and exclusion criteria was:

1. Patients with end-stage chronic kidney disease due to obstructive uropathy undergoing hemodialysis.
2. Patients in the hemodialysis unit at Dr. Saiful Anwar Malang for the 2021-2023 period.
3. Has a complete medical record data: (1) gender, (2) comorbidities, (3) causes of obstructive uropathy with features of hydronephrosis.
4. Patients with incomplete medical records and who died while undergoing hemodialysis were excluded from the study.

Result

From a total of 182 medical record data, there were 32 patients who met the inclusion criteria (Table 1). Table 1 showed that male patients are dominant over females. Table 2 presents the distribution of patients based on comorbidities. It showed that comorbid hypertension is the highest among the others. On the other hand, Table 3 presents the distribution of patients based on the causes of obstructive uropathy. Table 3 showed that urinary tract stones are the most common cause of obstructive uropathy.

Tabel 1. Distribution of patients based on gender

Gender	Number	Percentage
Male	17	53,13%
Female	15	46,87%
Total	32	100

Tabel 2. Distribution of patients based on comorbidity

Comorbidity	Number	Percentage
Hypertension	23*	71,88%
Obstruction	21*	65,63%
Infection	2	6,25%
Other		
Autoimmunity	2	6,25%
Total	32	100%

*There were 16 patients who had comorbid hypertension accompanied by obstruction.

Table 3. Distribution of patients by the cause of obstructive uropathy

Comorbidity	Number	Percentage
Oncology	7*	65,63%
Uterine fibroid	1	6,25%
Cervical cancer	2	6,25%
Cervical cancer stage IIB	1	3,13%
Cervical cancer stage IV	1	3,13%
Rectosigmoid junction cancer	1*	3,13%
Bladder cancer	1	3,13%
Prostate Enlargement	5*	15,63%
Urinary Tract Stones	20	62,5%
Right renal	6**	18,8%
Left renal	7**	21,88%
Left ureter	1	3,13%
Unknown	9	
Obstructive Ureteropelvic Junction	1	
Total	32	100%

*One patient whose uropathic obstruction was caused by malignancy of the rectosigmoid junction, prostate enlargement, and urinary tract stones

**Three patients' stones were found in the right and left renal

Discussion

CKD and Gender

In this study, there was more CKD in men (53.13%) than women (46.87%). Indonesia Renal Registry (IRR) (2018), also found that the number of patients experiencing chronic kidney failure was higher in men [2]. The structure of male urinary tract is more susceptible to obstruction (obstructive uropathy) due to the risk of prostate enlargement or benign prostate hyperplasia (BPH). Between an

incidence rate of 1.7 per 1000 people, 10% of all cases are acute and chronic kidney disease, while 5% of the chronic dialysis population are caused by obstructive uropathy [3][4]. In addition, the male urinary tract is longer and smaller, making it easier for the stone-forming substances to deposit in physicochemical conditions, so that the chance of obstruction is greater [5-6].

Apart from anatomical factors, hormonal factors, especially testosterone in men, are also involved in the incidence of CKD due to obstructive uropathy. Based on lithogenic factors, androgen or testosterone hormones increase oxalate excretion, plasma oxalate concentration, plasma calcium crystal deposition, and calcium oxalate deposition in the kidneys, while estrogen reduces these conditions [6-8]. The condition of the intestines can also be worsened if the diet is not maintained and the patients are frequently holding back urination [6].

Behavior and lifestyle also affect the obstructive uropathy incidence, where men tend to not pay enough attention to their lifestyle, including excessive consumption of fat, salt, alcohol, carbonated energy drinks, coffee, and smoking, compared to women [2][9-10]. Smoking habits in men increase the risk of developing CKD due to its pressure on the kidneys, making them work harder [5]. The lifestyle mentioned above can also cause hypertension which raises the risk of CKD [11].

CKD based on comorbidities

In this study, the highest types of comorbidity were hypertension (71.88%) and obstructive (65.63%) . A research conducted at the Dr. Esnawan Antariksa Air Force Hospital, Hemodialysis Unit of PKU Muhammadiyah Hospital Yogyakarta, RSUP Dr. Mohammad Hoesin in Palembang, and IRR (2018) support this result, where hypertension is the highest type of comorbidity [9][12].

Hypertension has a strong relationship with CKD. When patients are having kidney diseases, it is very likely for the patients to also suffer from hypertension [2][9]. This is because hypertension can cause changes in the blood vessels, where the walls can thicken as an adaptive response. If this condition occurs in the kidney, the tunica intima part of the vessel in the renal glomerulus thickens, causing vasoconstriction, and triggers damage to the renal blood vessels [9-10]. Further, vasoconstriction occurs in the afferent arterioles will reduce blood flow into the glomerulus and activate the Renin Angiotensin-Aldosterone system (RAAS) which will further increase blood pressure to increase blood flow in the afferent arteriole [10]. This mechanism may compensate for the lack of blood flow to the kidneys at first, but it may lead to kidney cell necrosis over time [10].

Additionally, the majority of hypertensive patients in Indonesia do not regularly take medication or even do not take medication at all due to lack of knowledge. It may lead to a serious kidney disease condition if not controlled and treated [6]. Patients with hypertension for 6-10 years have proven to have 24 times higher risk of developing CKD compared to someone who did not have hypertension, and can increase up to 34 times if the hypertension persists for more than 10 years [12].

Chronic kidney disease can also be caused by urinary tract obstruction [14-15], as in [14] be the second leading cause of CKD. Obstructive conditions of the urinary tract can occur at any age and ultimately disrupt kidney function, increasing the risk of CKD up to 3.6% [1]. There are several things that need to be considered to determine the degree of kidney damage, starting from the severity of the obstruction (partial or complete, unilateral or bilateral), the initial condition of the kidneys, the chronicity of the obstruction (acute or chronic), to other morbidities such as urinary tract infections [13]. Severe and prolonged obstructive condition can cause the kidney parenchyma to reduce into a thin ring of atrophic tissue due to ischemia of repeated hyperfusion, where the damaged tubules will cause the release of local proteases and free radicals that can damage the renal parenchyma [1].

Infections, such as Urinary Tract Infections (UTI), also play a role in CKD [9]. If urinary tract infections occur together with vesicoureteral reflux, it eases the formation of scars in the kidneys [12]. Patients with persistent kidney infection will have 5 times greater risk of CKD [1]. Even though at a very small incidence, autoimmunity also plays a role in CKD. Other studies also found autoimmune disease as a small portion of the risk factors of CKD [2][12][16-17]. It is reported that 60 percent of systemic lupus erythematosus patients suffered from kidney damage [16].

CKD caused by uropathic obstruction

The most common cause of obstructive uropathy is urinary tract stones (62.5%) and malignancy (21.88%). Studies showed that of all cases of CKD, 33-52% are caused by obstructive uropathy [18-20]. Additionally, an autopsy series study of 59,064 individuals ranging from neonates to geriatrics showed that 3.1% suffer from hydronephrosis [13]. Moreover, 6.8% of 4001

patients treated in geriatric wards in 3 hospitals in England were diagnosed with kidney disorders, with 9.5% of them being caused by obstructive uropathy [13].

One of the most common causes of obstructive uropathy found in this study is urinary tract stones. According to Tjekyan in 2014, there is a significant relationship between the history of urinary tract stones and obstructive uropathy. Studies also reported that patients with recent history of urinary tract stones have a higher chance to develop CKD [12][21][22]. Urinary tract stones can increase intratubular pressure and vascular vasoconstriction which can lead to ischemia in the kidneys. Prolonged ischemic conditions can cause glomerulosclerosis, renal atrophy, and interstitial fibrosis, which can lead to permanent elimination of up to 15% of nephron function [12].

Urinary tract stones often occur in young adults, while BPH is more common in older adults [4][22]. BPH can cause obstruction due to the long and narrow structure of male urinary tract, so stones are easier to form [6]. Additionally, malignancy and congenital abnormalities also play a role in the incidence of CKD. Studies have supported this result, and stated that around 90% of malignancies are found in the urinary tract, including cervical carcinoma which was also found in this study [4][6][13][23-26].

Conclusion

Men are more likely to have CKD. Patients with hypertension comorbidity have a higher chance to develop CKD. Urinary tract stones are the most leading causes of obstructive uropathy in CKD patients.

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