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# Duration of chronic kidney disease: As predisposition factor for erectile dysfunction in routine hemodialysis patients



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## ABSTRACT

**Background:** Chronic kidney disease (CKD) has a high global prevalence with an estimated prevalence of 10.6%. While the global prevalence of erectile dysfunction (ED) is 18.4% in men aged > 20 years and 33% aged > 50 years. ED is found in 70% of CKD patients. The aim of the study is to determine the relationship between duration of chronic kidney disease with ED in patients undergoing routine hemodialysis.

**Method:** A cross-sectional study conducted from 1 October 2018 to 18 June 2019 of 60 CKD patients undergoing hemodialysis. History and examination were carried out using the International Erectile Function Index (IIEF-5) questionnaire.

**Result:** Out of 60 samples, 42 patients (70%) had ED. The average duration of chronic kidney disease resulting in mild, moderate-moderate and moderate ED was  $10.94 \pm 10.79$ ,  $24.20 \pm 17.84$  and  $38.40 \pm 16.78$  months, respectively. Univariate analysis using Spearman rank correlation showed a direct relationship between the duration of CKD and DE ( $P = 0.00$ , R squared 0.814).

**Conclusion:** Duration of chronic kidney disease has strong relationship with ED in hemodialysis patients

**Keywords:** erectile dysfunction, duration, kidney disease, severity.

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## INTRODUCTION

Chronic kidney disease (CKD) is a condition of kidney structure or function disorder that occurs for more than 3 months and has health implications.<sup>1-3</sup> The global incidence of CKD is 10.6% (95% CI 9.2% -12.2%). In Indonesia showed that the province with the highest prevalence of CKD was Central Sulawesi 0.5%, followed by Gorontalo, North Sulawesi, and Aceh each by 0.4%.<sup>4,5</sup>

Sexual dysfunction is one of complication of chronic kidney disease. Erectile dysfunction (ED) occurs in 70% of cases of chronic kidney disease.<sup>6</sup> In addition, it was reported that about 40% of men undergoing hemodialysis experience ED accompanied by a decrease in libido, 30% of patients with CKD do not engage in sexual activity and 44% of patients only engage in one sexual activity per week.<sup>7</sup> The process of ED in chronic multifactorial CKD includes decreased arterial blood flow, venous leakage due to shunts, changes in penile smooth muscle function, hormonal disorders, drug side effects, and neurogenic dysfunction.<sup>8,9</sup> In addition, psychological and physical pressure also plays a role in this situation. The purpose of this study was to determine the relationship between the patient's duration of chronic kidney disease and the incidence of

ED in the dr. Zainoel Abidin General Hospital of Banda Aceh.

## METHOD

A cross-sectional observational analytic study was conducted at the Dr. Zainoel Abidin General Hospital of Banda Aceh during the period 1 October 2018 to 18 June 2019. A total of 60 male patients with CKD were evaluated using the International Erectile Function Index (IIEF-5) questionnaire. Unmarried patients, patients with diabetes mellitus and patients with a previous ED were excluded from this study. Data were collected on patient characteristics and ED status testing using IIEF-5. IIEF-5 scores have values ranging from 5 to 25 and degrees of ED are classified into severe (5-7), moderate (8-11), mild-moderate (12-16), mild (17-21) and without ED (22 -25).

Primary data on patient characteristics including age, duration of chronic kidney disease, causes of chronic kidney disease, and other laboratory values are presented in terms of frequency and proportion.

Bivariate analysis was performed using the Spearman rank correlation. Values are considered significant if  $p < 0.05$ . Correlation coefficient values

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are used to assess the strength of the relationship and the direction of the variable.

## RESULT

60 patients participating in the assessment, they had an average age of  $36 \pm 3.24$  years. Based on

the results of laboratory tests, the average values for hemoglobin, leukocytes, urea, creatinine, and blood glucose were  $8.52 \pm 0.65$ ,  $8113.33 \pm 2136.72$ ,  $155.15 \pm 22.66$ ,  $11.14 \pm 5.67$  and  $97.18 \pm 9.83$  respectively (Table 1). The mean duration of CKD was  $16.30 \pm 17.78$  months with an IIEF-5 score of  $17.22 \pm 5.21$  (Table 2). We also analyzed the profile

**Table 1** CKD Patients' Characteristics

Basic Characteristics	Mean $\pm$ Standard Deviation
Age (year)	$36 \pm 3.24$
Hemoglobin (g/dl)	$8.52 \pm 0.65$
Leukocytes ( $\mu$ l)	$8113.33 \pm 2136.72$
Urea (mg/dl)	$155.15 \pm 22.66$
Creatinine (mg/dl)	$11.14 \pm 5.67$
blood glucose (mg/dl)	$97.18 \pm 9.83$
Duration of Suffering CKD (month)	$16.30 \pm 17.78$
Index Score of erectile function (IIEF-5)	$17.22 \pm 5.21$
Age-based on ED level (year)	
Normal	$36.00 \pm 3.30$
Mild Dysfunction	$35.88 \pm 3.18$
Mild-moderate dysfunction	$36.80 \pm 2.67$
Moderate Dysfunction	$37.60 \pm 4.08$

**Table 2** Profile of CKD patients, ED level and psychological-depression aspects in CKD patients

Basic Characteristics	Frequency (n)	Percentage (%)
<b>Etiology of CKD</b>		
Hypertension	39	65.0
Idiopathic	12	20.0
Nephrolithiasis	9	15.0
<b>Nutritional status</b>		
Good Nutrition	51	85.0
Poor Nutrition	9	15.0
<b>Smoking</b>		
Yes	52	86.7
No	8	13.3
<b>Education Level</b>		
Higher Education (diploma/Undergrad)	6	10.0
High Schools (Junior-Senior High Sch)	54	90.0
Elementary (Elementary)	0	0.0
<b>ED Level based on IIEF-5</b>		
Number of Patients without Dysfunction	18	30.0
Number of Patients with Dysfunction	42	70.0
Mild dysfunction	17	28.3
Mild-moderate dysfunction	15	25.0
Moderate dysfunction	10	16.7
Severe dysfunction	0	0.0

**Table 2** *Continue*

Basic Characteristics	Frequency (n)	Percentage (%)
<b>Psychological-depression aspects (PHQ-9)</b>		
Normal-minimal	44	73.3
Need Supervision	14	23.3
Moderate	2	3.3
Severe	0	0.0
Highly Severe	0	0.0

**Table 3** The difference in the Duration of CKD on the Occurrence of ED

Variable	Duration of Suffering CKD		p-value*
	Mean	Standard Deviation ( $\pm$ )	
ED Level			
Normal	2.50	2.12	0.00
Mild dysfunction	10.94	10.79	
Mild-Moderate dysfunction	24.20	17.84	
Moderate dysfunction	38.40	16.78	
Severe dysfunction	0	0.00	

Note :\* based on Kruskal Wallis test

**Table 4** Relationship between the Duration of CKD on the Occurrence of ED

Duration of suffering CKD	Normal	DE	p-value
0-6 months	17 (28.33)	7 (11.67)	0.00
7-12 months	1 (1.67)	15 (25.00)	
>12 months	0 (0)	20 (33.33)	
Total	18	42	

**Table 5** Relationship between the duration of CKD on the degree of ED

Variable	Dysfunction degree			R-square*	p-value*
	Mild	Mild-moderate	Moderate		
Duration of CKD					
0-6 months	6 (6.8)	1 (1.7)	0 (0.0)	0.814	0.00
7-12 months	9(15.0)	5(8.3)	1 (1.7)		
>12 months	2 (3.3)	9 (15.0)	9 (15.0)		

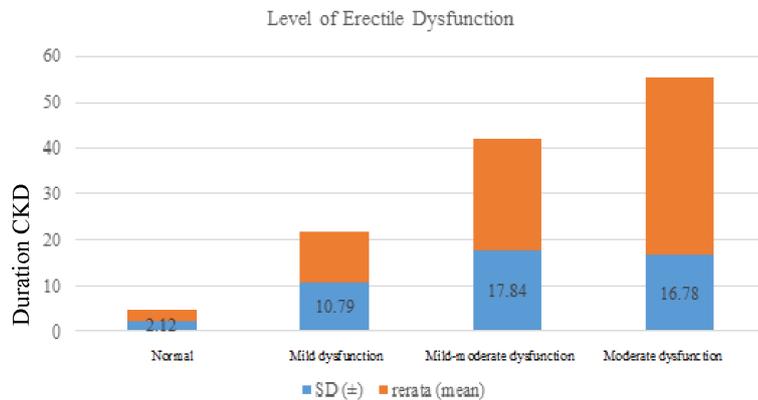
Note: \* based on the Spearman correlation test

of CKD patients including etiology, degree of ED and aspects of patient psychology (Table 3).

The relationship between the degree of ED and duration of chronic kidney disease is presented in table 4. In patients without ED, the mean duration of developing chronic kidney disease is  $2.5 \pm 2.12$  months. The longer the patient suffered from chronic kidney disease, the higher the degree of DE patients ( $P = 0.00$ ). The mean duration of patients suffering from chronic kidney disease resulting in mild, moderate, moderate or severe ED, respectively  $10.94 \pm 10.79$ ,  $24.20 \pm 17.84$  and  $38.40 \pm 16.78$  months. In the statistical analysis, there was a significant difference between the duration of chronic kidney disease and the level of ED ( $p = 0.00$ ).

The relationship between the duration of suffering from CKD on the incidence of ED is presented in table 5. The longer the patient suffering from CKD, the more likely the patient to experience ED. This can be seen in the onset of 0-6 months, only 7 (11.67%) patients with ED compared to 17 (28.33%) normal patients. Whereas at the time of onset of more than 12 months, all patients experienced ED (Figure 1).

There is a direct relationship between the duration of suffering from CKD and the degree of DE ( $P = 0.00$ , R square 0.814). At the onset of 0-6 months, 28.3% of patients did not have ED while 6.8% had mild dysfunction and 1.7% mild-moderate dysfunction. However, in the onset of 7-12 months,



**Figure 1** Diagram of the duration of CKD on the level of ED

there was an increase in the incidence of mild ED by 15% and moderate DE by 8.3%. In the onset of more than 12 months, 15% have mild-moderate ED and 15% have moderate ED. The longer the patient has CKD, the more progressive levels of ED the patient will experience.

## DISCUSSION

Impaired sexual function is often found in patients with chronic kidney disease. In this study we evaluated the relationship between the duration of suffering from CKD on the occurrence of ED, so we can know the duration and progression of CKD until triggering ED, this can be a consideration in starting therapy. CKD patients in this study had an average age of  $36.43 \pm 3.24$  years with CKD onset for  $16.30 \pm 17.78$  months.

Globally the incidence of chronic kidney disease increases with age. Meanwhile, when reviewed based on ED levels, the average age of patients when experiencing mild-moderate ED was  $36.80 \pm 2.67$  years and increased to  $37.60 \pm 4.08$  years in moderate dysfunction. These results are in accordance with the National Health and Nutrition Examination Survey (NHANES) report for 2007-2012 which explains that 5.7% of patients with chronic kidney disease are in the age range of 20-39 years, 8.9% at age 40-59 years and 33.2% above 60 years. In addition, Al Khallaf et al. reported that patients with ED in the population undergoing hemodialysis had an average age of  $38.2 \pm 6.6$  years.<sup>10,11</sup>

But in another study by Nishida et al. in 2016 reported that ED was not affected by the length of undergoing hemodialysis. This might be influenced by the study sample which is dominated by the elderly ( $59.2 \pm 10.7$  years). In another study reported that old age was the main predictive factor of ED in CKD patients.<sup>12</sup>

In laboratory evaluation it is known that patients with kidney failure have an average hemoglobin of

$8.52 \pm 0.65$ , leukocytes  $8113.33 \pm 2136.72$ , urea  $155.15 \pm 22.66$  and creatinine  $11.14 \pm 5.67$ . This illustrates that anemia and uremia in kidney failure are common conditions. Anemia occurs due to kidney failure in producing erythropoietin (EPO) so that the stimulation of erythrocyte production is inhibited. The condition of uremia in patients with CKD will also slow the survival of erythrocytes. The prevalence of anemia increases based on the decrease in the patient's GFR. Patients with anemia, accompanied by other accompanying risk factors, will increase the risk of ED. Anemia and uremia can also cause ED due to decreased oxygen delivery to the corpora cavernosa, decreased nitric oxide, failure of sympathetic stimulus for erection and increase in endothelium-derived factors that can inhibit erectile capacity.<sup>13-15</sup>

The most common causes of CKD in this study were hypertension (65%) followed by idiopathic (20%), and nephrolithiasis (15%). Globally it is explained that renal glomerular damage is most often caused by diabetes mellitus (33%), autoimmune, systemic infections and neoplasms. Meanwhile, in vascular damage, hypertension is the main cause of chronic renal failure (21%). Kidney obstruction such as nephrolithiasis and urinary tract stones has also been reported to be one cause of CKD.<sup>16-17</sup>

Besides being caused by the etiologies mentioned above, ED can also be caused by the psychological aspects of the patient. In this study, 44 patients (73.3%) did not have depression. Psychological status of patients who need supervision as many as 14 patients (23.3%) and patients with moderate depression as many as 2 patients (3.3%). There are no patients with severe or very severe depression. This shows that there is a predominance of normal patients without depression in this study population. The mechanism of the relationship between depression and ED is still unclear. However, there is a role for behavioral models as well as biological changes that increase the risk of ED in depressed patients. Behavioral models explain that patients with depression tend to have negative thoughts and lack of confidence resulting in anxiety which reduces erectile function. Biologically, patients with depression will affect the hypothalamic-pituitary-adrenocortical (HPA) axis which causes excessive catecholamine production so that the relaxation function of the cavernous muscle deteriorates and ED occurs.<sup>18</sup>

ED assessment in CKD patients using the index of erectile function (IIEF-5) score in this study had an average value of  $17.22 \pm 5.21$ . Patients with CKD had the most severe ED 28.3%, mild-moderate 25% and moderate 16.7%. In addition, we also found

that patients with CKD are still in normal condition or without ED in the average length of illness  $2.50 \pm 2.12$  months. The mean duration of CKD in mild, moderate-moderate and moderate ED patients was  $10.94 \pm 10.79$  months,  $24.20 \pm 17.84$  months and  $38.40 \pm 16.78$  months.

In this study, we also divided the onset of the duration of illness experienced by patients, when 7-12 months were generally in the condition of mild dysfunction (15%), but at the time of > 12 months, the ED level experienced increased more to mild ED - is 15% and moderate dysfunction is 15%. The Kruskal Wallis test shows a direct relationship with a significantly strong correlation between the duration of suffering from CKD ( $p = 0.00$ , R-square 0.814). The longer the patient has CKD, the heavier the ED level. Mesquita et al. reported that 86.4% of CKD patients will experience ED in less than 60 months. Another report by Yuan et al. also in the follow-up of patients with CRF 2-4 years found the incidence of ED increased 9.10/ 1,000 patients each year and increased to reach 16.92/1,000 people annually after 4 years.<sup>19-20</sup>

## CONCLUSION

The duration of CKD has a correlation with the occurrence of ED in hemodialysis patients at Dr. Zainoel Abidin General Hospital in Banda Aceh. With a P-value of 0.00 and R-square 0.814, it shows that there is a very strong relationship between variables.

## CONFLICT OF INTEREST

The author declares there is no conflict of interest regarding publication of current study.

## FUNDING

This research doesn't receive any specific grant from government or any private sectors.

## ETHICAL CONSIDERATION

Current study has been approved by Ethical Committee Faculty of Medicine Universitas Syiah Kuala/Dr. Zainoel Abidin Genera Hospital, Banda Aceh, Indonesia.

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