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Original Paper

Prevention of Kidneys Failure in Patients with Heart Diseases at Cardiology Institut of Abidjan

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Abstract

The prevalence of chronic kidney disease (CKD) is high and it is gradually increasing. Arterial hypertension accelerates many forms of renal disease and hastens the progression to ESRD. Patients with heart diseases with medication have not enough knowledge about the diet increasing kidney failure risks. ***Methods:*** *This descriptive study included 42 selected randomly patients with cardiovascular complications with hypercreatininemia. Food frequency questionnaire was used. Creatininemia and clearance of creatininemia measurement were done.* ***Results:*** *The results of food frequency questionnaire shown that patients with higher serum creatinine are those who drink less than 1,5 liters of water a day and/or those have not a good repartition in water consumption. Patients with higher serum creatinine are those who drunk less than 1,5liters of water a day and those (p≤0.5%). Then, Meals with frying induced more triglyceride production than meals with sauce (p≤0.5). Among beverage, sodas and homemade juices were most consumed respectively at 36.6 and 51.3%.* ***These*** *beverages were associated with higher serum creatininemia. After 3 months of nutritional advises, drop in serum creatininemia were observed.* ***Conclusion:*** *Lowering serum creatinine involved augmentation in water amount consumption and good water consumption establishing. It also recommends Sodas and homemade Juice reducing Sodas should be reduce consumption and promoting water drinking.*

Keywords

Hypercreatininemia, clearance, water volume, water distribution

1. Introduction

The prevalence of chronic kidney disease (CKD) is high and it is gradually increasing. Estimates of the global burden of disease indicate that diseases of the kidney and urinary tract account for approximately 830,000 deaths and 18,467,000 disability-adjusted life years annually (Hostetter, 2004). There are many causes of these diseases. They varied from chronic diseases such as Diabetes, cardiovascular diseases, diet and others.

Indeed, diabetes has become the single most important cause of ESRD in the United States and Europe (Stengel, Billon, van Dijk, Jager, Dekker, & Simpson, 2003). Hypertension and kidney disease are closely related. Arterial hypertension accelerates many forms of renal disease and hastens the progression to ESRD (Luke, 1999). The influence of certain types of nutrients has been widely studied in relation to kidney function. High protein intake may lead to increased intraglomerular pressure and glomerular hyperfiltration. This can cause damage to glomerular structure leading to or aggravating chronic kidney disease (CKD) (Gang Jee Ko, Yoshitsugu Obi, Amanda R. Tortoricci, & Kamyar Kalantar-Zadeh, 2017). High protein diet, usually defined as >1.2 grams of dietary protein per kilogram of body weight a day (g/kg/day), is known to induce significant alterations in renal function and kidney health (Kalantar-Zadeh, Moore, & Tortorici, 2016). About sugar, authors shown that people who regularly consumed one or more sugar-sweetened soft drinks a day had 58% increased risk of developing CKD compared to those who did not consume this type of beverage (Cheungpasitporn, Thongprayoon, O'Corragain, Edmonds, Kittanamongkolchai, & Erickson, 2014).

Despite the fact that the influence of certain types of nutrients has been widely studied in relation to kidney function and overall health condition of CKD patients, there are few studies on the impact of specific diet precisely, the impact of water consumption on their survival. Recent studies have firmly established the importance of continuous blood pressure reduction to slow the progression of many forms of renal injury, particularly glomerular disease (Agodoa et al., 2001; Peterson et al., 1995).

The primary objective of this study was to examine real causes of hypercreatininemia in our patients under treatment. A second aim was to propose an adequate diet within water consumption to reduce kidney diseases.

2. Research Design and Methods

This study was conducted at Cardiology Institute of Abidjan (Côte d'Ivoire) in 2018. During 4 months, dietary trials were proposed to patients with high creatininemia by modification of their habitual diets when necessary.

2.1 Screening Phase

Forty two (42) volunteers with high creatininemia with average aged about 47.5 ± 79.5 years participate to the study. The minimum age was 44 years and the maximum one was 72 years. Their creatinine levels varied between 15 and 20 mg/l. These patients with hypercreatininemia were non-smoker and no taking medication known to affect lipid metabolism from the clinical practices.

2.2 Dietary Interventions

Recommendations were delivered during one-to-one consultation sessions. Volunteers were asked about their habitual diets by answering a questionnaire developed on local foods. Food frequency Questionnaire focused on type of breakfast, lunch and dinner were used. It also focused on type of meal, number of meal and type of beverage. Diets mistake were then explained and advices were given to them during 30 to 45 minutes for changing experimenting. The nutritionist, in consultation with each volunteer, drew up meal programs for the study period and patients noted no change from the original program.

The nutritionist gave dietary advice to participant in order to avoid stressful diets. They met 2 weeks after the first consultation for the check-up. No portion size was indicated. They had choice among the proposed diet at breakfast and lunch, but they should follow strictly the dinner diet day by day. Only men were authorised to add 40 g of bread to vegetable soup on Tuesday and Friday when required. It was a hypocaloric diet especially in the evening.

The diet included low saturated fats, and increased in breads (morning and evening), roots tubers, vegetables and fish. It also had less red meat and more poultry. The participants were also taught to prepare their own meals or not.

In addition, fruits consumption was studied and limited to one fruits during the study.

2.3 None Dietary Interventions

Although exercising was encouraged during 45 minutes, patients were allowed to choose other types of moderate-intensity physical activity twice or 3 times a week.

2.4 Creatininemia and Clearance Control

Analyses were led each 2 months and half (75 days). First samples were made at T0. Second samples were made 75 days later and this date was mentioned T0 then T1 and T2. Plasma levels of creatininemia and clearance of creatininemia were measured using automated procedures in Cardiology Institute Laboratory.

2.5 Exclusion Criteria

Patients with weight higher than 100kg and those who aged more than 75 were not included in this study.

2.6 Statistical Analysis

The creatinine and creatinine clearance measurements made at each time (T0, T1 and T2) were compared in relation to the variation in the volume of water and soda consumed daily. The frequency of consumption and the daily distribution of catches in the period concerned. This was achieved by various analysis tests (ANOVA) with one / and / or two classification criteria in order to see if there is a difference in the evolution of the level of each parameter studied (serum creatinine and creatinine clearance).

The significance of the difference in the means is determined by comparing the probability p associated with the Fischer-Senedecor test statistic to the theoretical threshold of $\alpha = 0.05$. So when $P \leq 0.05$, there is a significant difference between the means. To process all of our data. All statistical tests were carried out using R software (R Core Team, Version 3.6.2 and the graphics were carried out on the one hand with this same software and on the other hand with Microsoft Excel software.

3. Results

The results of our study is shown in tables and figures below.

Table 1. Values According to Daily Water Consumption

Parameters	daily water volume		Pr(>F)
	less than 1.5 l	up than 1.5 l	
Number (percentage)	27 (64.28%)	15 (35.72%)	
Serum creatinine (mg/l)	18.9 ±3,73	17.06 ±1.75	0.01808
Clearance of creatinine (ml/min)	57.04 ±13,51	60.32 ±9.8	0.37043

Table 1 shows the results of the water consumption survey on serum creatinine values and serum creatinine clearance. Among the 42 volunteers, 27 of them (64%) of the patients consumed less than a liter and a half of water per day compared to 15 others who drank more. People with a summation of less than a liter and a half had the highest values 18.9 ±3.73 mg / l against 17.06 ±1.75 mg / l the others.

Regarding creatinine clearance, it changes in the opposite direction to creatinine. The lowest values 57.04 ml / min were observed in patients with low water consumption. Those with water consumption above 1.5 L per day had an average clearance value of 60.32 ±9.8 ml / min.

Table 2. Values According to Daily Water Consumption Plan

Paramètres	Matin et soir	toute la journée	cure d'eau	Pr (>F)
Effectif	26 (61.91%)	12 (28.57%)	04 (9.52%)	
Créatininémie (mg/l)	19.31 ±2,86	17.61 ±4.17	18.25 ±2.75	0.15540
Clairance de la Créatininémie (ml/min)	56.55±9.49	62.02±20.75	57.7±10.92	0.77287

The results of serum creatinine and creatinine clearance according to the distribution of water consumption are presented in Table 2. It emerges from this survey that patients with morning and evening water consumption are in the majority (61.91%) with the highest mean creatinine levels around 19.31 ±2.86 mg / l and a clearance of 56.55 ±9.49 ml / min.

Patients with kidney problems with a consumption of water distributed throughout the day represent 28.57% with an average serum creatinine of 17.61 ±4.17 mg / l. This group presents the critical mean clearances (62.02 ±20.75 ml / min). Patients who consume water only in the evening represent 16.67% with an average serum creatinine of 16.85 ±2.41 mg / l and an average clearance of 62.02 ±20.75 ml / min. The number of patients taking water cures is the least (9.52%) with an average serum creatinine of 18.25 ±2.75 and an average clearance of 57.7 ±10.92 ml / min.

The clearance does not vary with the volume of water consumed by the subjects (P> 0.05), it also does not vary with the distribution of water consumption during the day (P> 0.05). On the other hand, the interaction between the volume of water consumed and its distribution during the day is very significant, so the clearance varies (P <0.05). 27 The subjects who have an usual consumption of water greater than or equal to a liter and half (1.5L) distributed throughout the day have the highest average clearance.

Table 3. Analysis Table of Variance of Serum Creatinine and Clearance According to the Mode of Water Consumption

Parameter	Factors of variation	Parameters of ANOVA			
		N	F-Value	ddl	p
Creatinine	Amount of water (1)	42	6.17	1	0.018
	Water consumption plan (2)		1.86	3	0.155n.s
	Interaction between (1) et (2)		1.46	3	0.243 n.s
Clearance of creatinine	Amount of water (1)	42	0.82	1	0.370n.s
	Water consumption plan (2)		0.38	3	0.773 n.s
	Interaction between (1) et (2)		8.67	3	0.000206

(*) : P < 0,05 ; (**) : P< 0,01 ; (***) : P< 0,001 ; n.s : non significatif (P > 0,05)

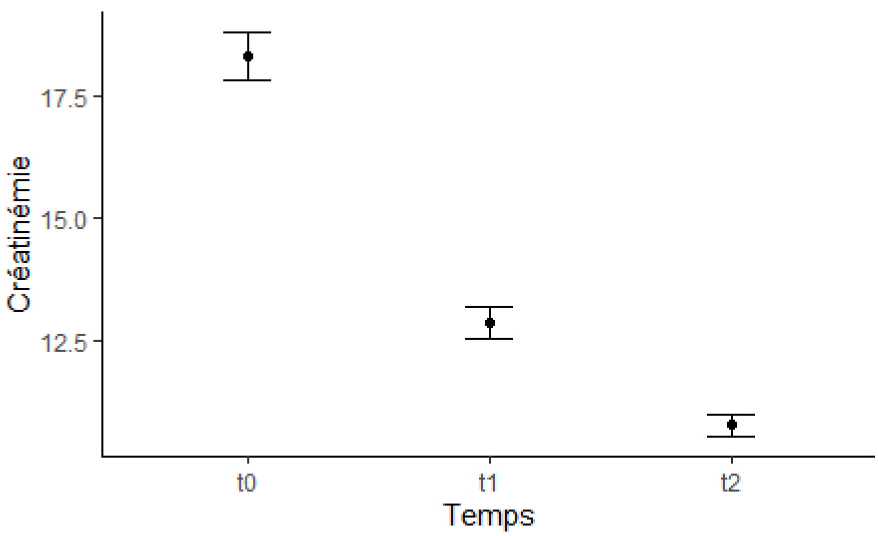

Figure 1. Evolution of Serum Creatinine

Figure 1 shows the evolution of serum creatinine during our study. A decrease in serum creatinine is observed. After 2 months of diet, the value drops from 18.31 ± 3.26 mg / l to 12.88 ± 1.99 mg / l, a decrease of 29.65%. During the second period of dietary monitoring, the drop in blood creatinine level is 16.3%, a final value of 10.78 ± 1.52 mg / l. The total decrease is estimated at almost 45.95%.

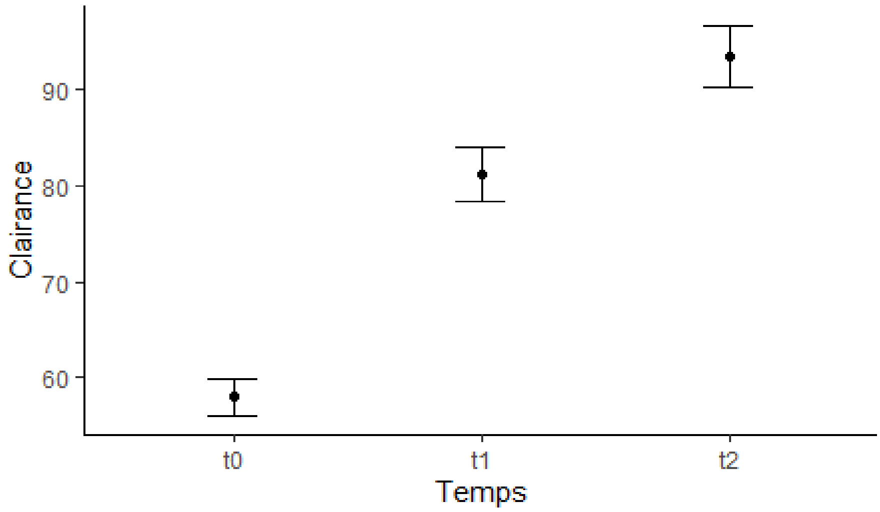

Figure 2. Variation in Creatinine Clearance

During our work, we observe an increase in the clearance value of creatinine. This constant goes from its initial value of 57.95 ± 12.25 mg / l to 81.24 ± 18.05 mg / l, an increase 40.18%. During the second part of our study, the clearance reached 91.61 ± 24.78, an increase of 12.51%. The total increase is estimated at almost 52.69%. (Figure 2)

4. Discussion

This study analyzed the correlation between water intake and the prevalence of kidney diseases in patients with heart diseases with medication. The research focuses on water amount intake and water plan establishing within other beverages.

This study highlights one of the main causes of kidney diseases in patients in cardiology under medication. Indeed, the results of the survey showed that 64% of patients with higher serum creatinine were used to drink less than a liter and a half of water a day. Studies in humans have shown that numerous factors affect fluid intake Availability, ambient temperature, flavor, flavor variety, beverage temperature, proximity of the beverage to the person, and even beverage container have all been shown to impact intake (WHO, 2004). Water consumption could vary with ageing according to some authors (Kim, Shin, & Kim, 2003). For these authors, during ageing, water consumption decreases as a result of reduced metabolic activities. Also, some patients unfortunately replace waters by sugar-sweetened beverage (homemade juice and Soda) with water consumption reducing. The first mistake by replacing water by these beverages is that these sweetened juice have a higher salt content in the form of sodium.

The sodium level of these drinks like apple juice sometimes reaches 218.03 ± 0.22% mg/l according to (Agbangnan Dossa Cokou Pascal, Ggohaïda Virginie, Bothon Fifa Théomène Diane, Kanfon Rose Estelle, Avlessi Félicien, Wotto Dieudonné Valentin, & Sohounhloue Koko Codjo Dominique1, 2018). These values are widely higher than those contained in running water (3 to 18mg/l). Recent studies have firmly established the importance of continuous blood pressure reduction to slow the progression of many forms of renal injury, particularly glomerular disease (Agodoa et al., 2001; Peterson et al., 1995). Indeed, High dietary sodium is an important factor influencing blood pressure, predisposing patients with established CKD to salt-sensitive hypertension and fluid retention (Carrero & Cozzolino, 2014; Luik et al., 2002). Renal damage associated with salt intake may be a result of its interaction with aldosterone (Lambers Heerspink, Navis, & Ritz, 2012). For these authors, more the blood pressure is higher, more renal damage are important.

On one hand, the first finding of the present study is that the amount of daily intake of water around 2liters and half revealed very useful to decrease the risk of renal failure by reduce the serum creatinine. This finding could be explained by the therapeutic benefits of water drinking on heart activity previously shown by several authors (Lu et al., 2003). The mechanism(s) by which water has its beneficial effect is unknown. It is known that water evokes a pressor response in patients with autonomic failure (Shannon et al.,, 2002) and improves orthostatic responses in the postural tachycardia syndrome (Kobayashi, 1957). Water drinking also enhances cardiovagal tone in young healthy subjects (Routledge, Chowdhary, Coote, & Townend, 2002). Some authors advocate that water drinking should be utilized as an adjunct to other methods of treatment for patients with postural syncope and suggest that these patients be encouraged to drink water (Claydon, Schoeder, Lucy, Norcliffe, & Hainsworth, 2006).

Our results are supported by the proposals made in Korea where the 2010 reference nutritional intake recommends, for men and women to drink 2.1 and 2.6 L / day and 1.8 and 2.1 L / day, respectively (Anonymos 2, 2010). Our results are also similar to that author who suggests drinking 30 ml of water per kilogram of weight (Chernoff, 1994).

On the other hand, beside of the amount of water intake, the main finding of our study was the correlation between daily intakes of water plan and clearance of creatinine. Our study has shown a significant decrease of clearance of creatinine when the daily consumption was spread over the whole day on 5 intakes.

5. Conclusion

Our study showed that there is now substantial evidence that lower water intake increases the risk of kidney diseases by increasing the serum creatinine level in patients with heart diseases with under medication. Dietary interventions have proven effective in reducing the risk of developing kidney by reducing serum creatininemia and increasing clearance of creatinine. The identification of risk factors can prevent or limit disease through lifestyle modifications. These findings reinforce the need to promote the continuing education for healthcare teams involved in the treatment of these patients, sponsoring the prevention and diagnosis of CKD at the early stages.

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