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Epidemiological and biological profiles of chronic renal failed at the University Hospital of Joseph Ravoahangy Andrianavalona in Madagascar

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Abstract

Introduction: Chronic renal failed is an irreversible decline in renal function as measured by glomerular filtration rate. The aim of this study is to describe the epidemiological characteristics of chronic renal failed.

Methods: This is a retrospective and descriptive study from January 1, 2019 to December 31, 2020 carried out at the UPFR (Paraclinical Unit of Training and Research) of Biochemistry and the USFR (Care Unit of Training and Research) of Nephrological intensive care of CHU-JRA (University hospital center Joseph Ravoahangy Andrianavalona). All biochemical analysis request forms prescribed by the nephrological intensive care department were included, with clinical information of chronic renal failure and confirmed GFR<60 ml/mn/1.73 m^2 on the patient's file.

Results: Fifty files were selected. The average age was 50.80 years, with a sex ratio of 1.5. The most affected population generally had a low standard of living. Hypertensive patients were the most common, accounting for 82% of cases, with diabetes in third place with 32% of cases. The mean creatinine level was 1067 µmol/l. The average glomerular filtration rate was 7.25. The uraemia was 44.20 mmol/l. Among the ionic disorders, hyperkalaemia was the most common, accounting for 68% of cases. Of the 78% (n=39) of patients who had a blood count, 92.31% (n=36) had normochromic normocytic anaemia.

Conclusion: Chronic renal failed remains a public health problem especially in low income countries. It is always associated with other disturbances of biological parameters that should be monitored and corrected.

Keywords: Chronic renal failed; Epidemiological and biological Profiles; Antananarivo; Madagascar

1. Introduction

Chronic renal failed (CRF) is an irreversible decline in renal function. It is based on a progressive decline in glomerular filtration rate (GFR) to less than 60 ml/min/1.73 m^2 over a period of three months or more [1]. In sub-Saharan Africa, the estimated prevalence of chronic renal failed (CRF) in adults is 13.9% [2]. In Antananarivo, the capital of Madagascar, the prevalence of CRF was 13.8% [3]. Chronic renal failed affects 8.51% of hospital records according to a study conducted in a large public health establishment in the capital [4].

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The choice of biochemical parameters and their standardisation are key elements in the screening and diagnosis of chronic kidney disease [5]. There are many biochemical markers, mainly in blood and urine that can be used as markers of renal function or renal damage. Creatinine is the most widely available and used biomarker of kidney function, from which glomerular filtration rate (GFR) will be estimated using the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equation recommended by the 2012 International Guideline on Improving Global Outcomes in Kidney Disease (KDIGO) for the initial assessment of GFR[6]. Our objective is to describe the epidemiological and biological characteristics of chronic renal failed in the biochemistry laboratory of Joseph Ravoahangy Andrianavalona University Hospital (CHU-JRA).

2. Methods

This is a retrospective and descriptive study of 2 years from January 1, 2019 to December 31, 2020 carried out at the UPFR (Paraclinical Unit of Training and Research) of Biochemistry and the USFR (Care Unit of Training and Research) of Nephrological intensive care of CHU-JRA. All biochemical analysis request forms prescribed by the nephrological intensive care department were included, with the clinical information being chronic kidney disease and confirmed by a glomerular filtration rate of less than 60 mL/mn/1.73 m^2 estimated from creatinine levels by the CKD-EPI equation (Chronic Kidney Disease EPIdemiology collaboration, Levey, 2009) for more than 3 months, whether or not associated with a renal structural abnormality, as recorded in the patient's file. The sampling was exhaustive. The study variables were gender, age, residence, socio-economic level with reference to the patient's professional activities, the patient's medical and toxic history, and reasons for hospitalisation, biochemical and haematological test results. The data were entered and processed on Microsoft Excel 2016 and Epi Info software version 7.2.3.1.

3. Results

In total, we retained 50 requests for analyses prescribed by the nephrological intensive care department. A male predominance was observed with a sex ratio of 1.5. The age of the patients ranged from 15 to 80 years and the mean age of the patients with chronic renal failed was 50.80 years.

Patients of low socio-economic status were the most represented with 38% of the cases. We have patients from all 10 regions of Madagascar but patients residing in the Analamanga region represented the majority of cases 64%, followed by the Vakinankaratra region in 8% of cases. In terms of medical history, hypertensive patients were the most common in our study, accounting for 82%, followed by a family history of cardiovascular disease, particularly family story of high blood pressure in 44%, diabetes in 32% and alcohol consumption in 30% of cases.

The main reasons for hospitalisation in the intensive care unit were hypercreatinemia in 46% and dyspnea in 26% of cases. Severe renal failure at stage 5 was observed in almost all cases, i.e. 92.00% (n=46). The mean creatinine level was 1067.44±646.35 with extremes ranging from 150 to 2816 µmol/l. The mean GFR was 7.26±1.25 ml/min. The mean uraemia was 44.21±23.58 with extremes of 9.99 mmol/l to 101.93 mmol/l. Hyperkalaemia was frequently observed with a mean of 6.09±0.83 mmol/l, extremes 5.1 to 8.2 mmol/l. Hyponatremia was encountered in one out of two cases, with a mean of 126.71±6.15 mmol/l and extremes of 114 to 134 mmol/l. Of the patients who had a blood calcium level (n=18) and a blood phosphorus level (n=13), hypocalcaemia was found in 61.11% (n=11) and hyperphosphaemia in 76.92% (n=10).

Seventy-eight percent of the patients had a blood count (39 or 78%) of which 92.31% (n=36) had anaemia, a moderate decrease in haemoglobin level between 80 and 99 g/l was common, the mean haemoglobin level was 86±22 g/l with extremes of 32 and 139g/l.. The majority of patients with anaemia were normocytic normochromic (69.44%). Hyperleukocytosis was observed in 48.72% with an average of 17.23± 8.11G/l. Table 1 summarises the different biological parameters according to gender.

None of the renal parameters showed significant differences between the genders. However, creatinine and uraemia were higher in men but the difference was not significant.

Table 1 Biological parameters according to gender

	Values Gender	**means**	**Min**	**Max**	**Reference values**	**p value**
Uraemia (mmol/l)	M	47,35	9,99	101,93	2,80-7,20	NS*
	F	38,41	10,69	64,66	-	NS
Creatinine (µmol/l)	M	1168	150	2421	53-115	NS
	F	915	219	2620	44-105	NS
GFR (mL/mn/1,93m^2)	M	7,34	1,46	46,75	90-130	NS
	F	7,13	1,19	24,35	90-130	NS
Natremia (mmol/l)	M	133	114	146	135-145	NS
	F	137	116	150	-	NS
Kalaemia (mmol/l)	M	5,57	3,2	7,8	3,5-5,0	NS
	F	5,1	2,8	8,2	-	NS
Chloremia (mmol/l)	M	95	81	114	96-108	NS
	F	100	80	115	-	NS
CRP (g/l)	M	79,58	2	162,3	<6	NS
	F	45,99	8,6	202,5	-	NS
Calcaemie (mmol/l)	M	1,9	1,56	2,18	2,20-2,65	NS
	F	2,41	1,67	3,06	-	NS
Phosphatemia (mmol/l)	M	3,7	2	6,03	0,80-1,60	NS
	F	2,09	1,17	3,48	-	NS
Haemoglobin (g/l)	M	85	32	139	120-180	NS
	F	87,4	63	118	110-160	NS

NS :Not Significant

4. Discussion

A prevalence study of CRF conducted by Ranivoharisoa E et al. in Antananarivo noted a male predominance with a sex ratio of 1.75 [3]. One study showed that the prevalence of severe forms (stage 5) is higher in men and mild forms in women [7]. This could explain this male predominance, as in our study the level of chronic renal failed is mostly in the end stage.

The male predominance could also be explained by the fact that women are protected due to their distinctive biological phenomenon namely glomerular structure, glomerular haemodynamics, renoprotective role for oestrogens [8], but also

to their lifestyle, men are more likely to have more risk factors such as smoking and excess sodium diet. Unlike other studies conducted by Olié V and Gabet A in France in 2014-2016 [9] and by Xue C and Ye XD in China in 2013 [10] where female predominance was observed. This variability in the prevalence of chronic kidney disease related to gender, in industrialised countries superimposed on the fact that the prevalence of chronic kidney disease is higher in women in the diabetic population [9-11]. The age range in our study was 15-80 years with a mean age of 50 years. The result on the average age found was similar to those reported by several local and sub-African studies. In sub-Saharan Africa, in Senegal, the mean age of patients with chronic renal failed was 50.86 years according to Diarawa M and Cisse [12]. In the United States and Japan, they had a much older population with an average age of 54 and 60 years respectively [13,14].This difference in the average age of patients with chronic renal failed could be explained by different lifestyle habits, poor hygiene in some countries and the ageing of the population in developed countries. The majority of our population came mainly from the area around the hospital where the study was done because the USFR Nephrological Intensive care Department and the UPFR Biochemistry Department are located in the Analamanga region, which is close and accessible to the surrounding population. The population most affected in our series generally had a low standard of living. This predominance of low socio-economic status has been revealed by previous studies conducted in Ivory Coast and Ghana, but in different proportions at 92% and 82% respectively [15,16]. The privileged impact of this socio-economic group could be explained not only by their low income, but also by the particularly high level of illiteracy in this area. This would be a probable reason for the frequent recourse of these subjects to drugs banned from the parallel market and to herbal therapy, which leads to kidney failure if not controlled. Another Cohort study of a large sample size of Americans found that low income was associated with a 50% increase in end-stage chronic renal failed [17].

In Africa, the main risk factor for CRF is hypertension. Many studies report an association between CKD and hypertension and/or diabetes [18-20]. This association between CRF and hypertension may be related to the fact that the use of ACE inhibitors or angiotensinogen antagonists accounts for only 34.15% (n=17), This is in contrast to the literature where renin angiotensin aldosterone system blockers should be prescribed due to their efficacy in nephroprotection and slowing down the deterioration of renal function [21], which underlines the renal therapeutic benefits of ACE inhibitors and angiotensinogen type 1 receptor antagonists [22]. In our study, the high frequency of chronic renal failed at stage 5 could be explained by the fact that the nephrology department is a referral centre for intensive care and dialysis receiving critical patients requiring emergency treatment. Akinzola [23] in Nigeria, reported a mean creatinine level of 1130 ± 576. Our results are slightly lower than those obtained by these authors. Dyskalaemia represents the most dangerous hydro-electrolytic disorders [24]. Diallo [25] reported a frequency of hyperkalaemia of 52.7%. Hyperkalaemia should be monitored as it can lead to cardiac complications. If water intake exceeds urinary excretion, which is common in CRF, the water balance becomes positive and water retention decreases natraemia by dilution of body fluids [26]. Urea, the main catabolite of nitrogen metabolism, increases according to the stage of CRF. A blood urea level slightly higher than normal does not indicate renal failure, but may simply be the result of nitrogen hypercatabolism. Conversely, some subjects have a virtually normal urea level when their overall renal function is already reduced by half. This low uraemia would then result from a low daily dietary protein intake. In patients with end-stage renal disease (ESRD), kidney disease leads to decreased secretion and increased retention of phosphate and reduced production of active vitamin D resulting in hypocalcaemia. Our results are similar to those of Birhie A et al in Adis Ababa with 90% anaemia [27]. Monconduit [28] also found moderate anaemia with a haemoglobin level of between 8 and 10 g/dl. However, our results differed from those of Akinzola [23] who reported a predominance of severe anaemia with mean haemoglobin levels of 7.22 ± 2.8 g/dl respectively. The majority of our cases (69.44%) were normocytic normochromic due to a lack of erythropoietin synthesis. The prevalence of anaemia increased with increasing stages of chronic renal failed and worsened with progressive decline in renal function [29]. CRP elevation during end-stage renal disease had two clinical meanings, one study concluded that, a CRP level greater than 10 mg/L correlates with a greater than 4% risk of developing fatal cardiovascular disease within 10 years. [30] C-reactive protein (CRP) levels are increased in 30-50% of dialysis patients and predict cardiovascular morbidity and mortality [31], subsequently, infections in dialysis patients are 100 times more frequent than in the general population and represent the second leading cause of mortality [32], chronic renal failed patients are immunocompromised.

5. Conclusion

Chronic renal failed is not decreasing in prevalence. Prevention and correct treatment of risk factors are essential to reduce the progression to end-stage renal disease. Monitoring of complications, especially biological complications of chronic renal failed, helps to improve the quality of care provided to patients with chronic renal failed.

Compliance with ethical standards

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Disclosure of conflict of interest

The Author declare no conflict of interest.

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