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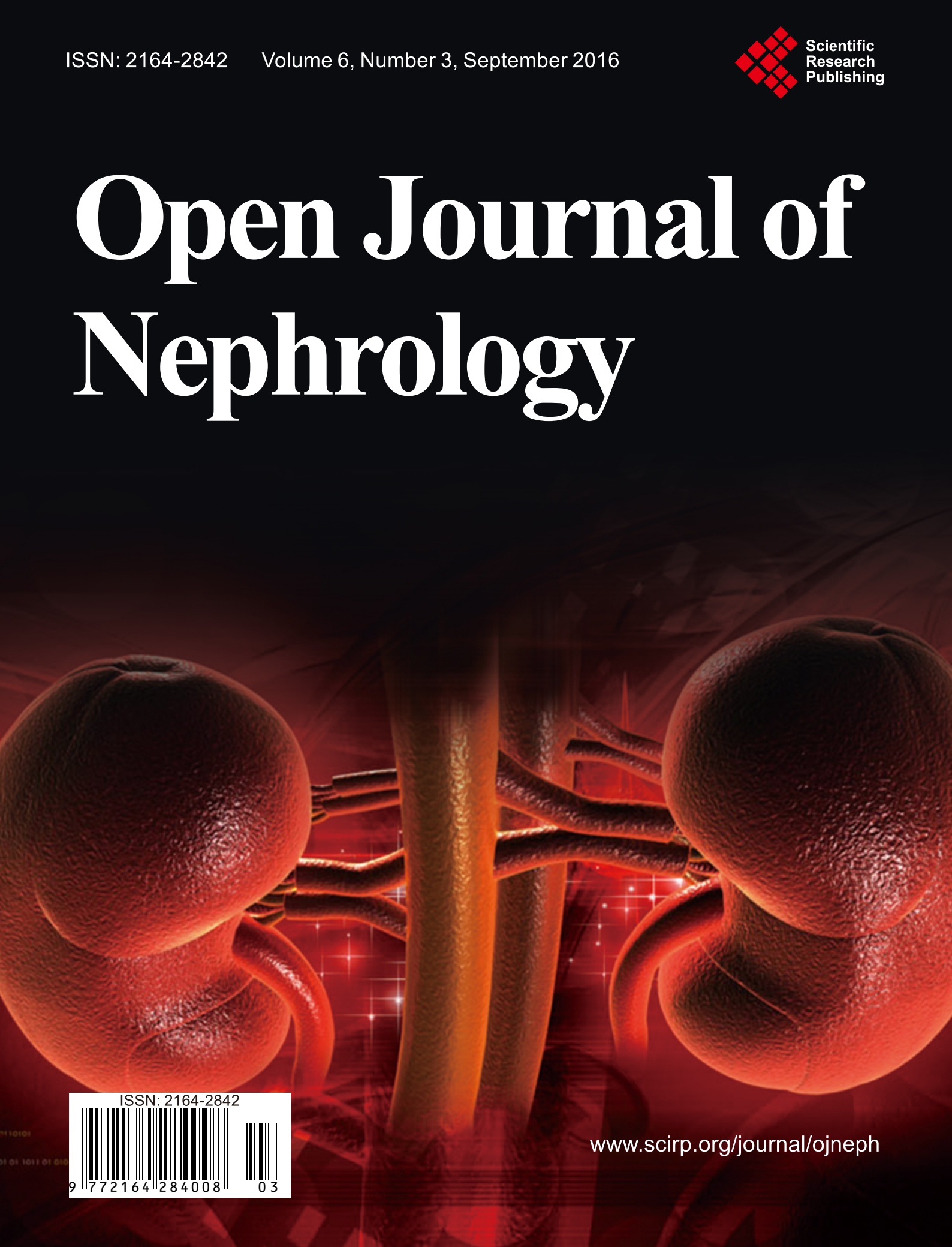

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Table of Contents

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Illness Narrative: Perceptions and Lived Experiences of Kidney Recipient Clients in Shanghai, China

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Abstract

Terminal kidney disease is a life threatening condition and cause for loss of hope to affected individuals. It affects the individuals physically as well as mentally. The advancement in medical knowledge and technology in transplant surgery has steadily increased the number of kidney recipients. This offers hope for the new lease of life and a wide range of perceptions and experiences with self, society and the new organ. There is minimal research on perceptions and lived experiences of kidney transplant recipients. This study explored the perceptions and lived experiences of individuals with a kidney problem living with a kidney transplant in Shanghai, China. Five in-depth interviews were conducted with five clients. The participant's age ranged from 25 to 45 years. There were three females and two males. Content analysis using NVivo (11.0) software was applied in data analysis. The findings revealed improved quality of life among kidney recipients; however the clients had low knowledge levels on the condition as well as self care practices in the post transplant period. This caused a lot of psychosocial stress in the clients. The post kidney transplant management strategies should include effective education programs to increase awareness on the condition and self care practices so as to reduce factors associated with psychosocial stress in order to improve the quality of life for the clients in the post kidney transplantation period.

Keywords

Kidney Transplant, Psychosocial Stress, Perceptions, Lived Experiences, Shanghai, China

1. Introduction

Kidney disease is a life threatening condition that subjects affected individuals to a challenging life experience. Chronic kidney disease (CKD) is a situation whereby there is a reduced glomerular filtration rate, increased urinary albumin excretion, or both [1]. The global prevalence of CKD is estimated to be around 8% - 16%. Around 10% of the global population is affected by CKD and millions die every year because of the unavailability of affordable treatment [2]. It is commonly associated with diabetes mellitus and in some settings causes such as herbal and environmental toxins are common. If it is left unattended to, CKD has severe lifelong complications that include cardiovascular problems, kidney injury, decline in cognitive function, risk of anaemia, bone disorders *i.e.* fractures and end stage renal disease (ESRD) [1]. Patients suffering from this condition face long time treatment related stressors. The recent advancement in medical knowledge and technology has made kidney transplant the most desirable remedy for patients with renal failure. Though kidney transplant is thought to improve the quality of life among the recipients, it brings with it new challenges and changes in life styles. Patients could live with persistent fear of organ rejection and compliance to life long course of treatment [3]. The patients often need to cope with changes in their concept of self, confidence and a change in family roles that the transplant procedure brings. These changes could affect the patient as a holistic person and affect their perceptions and lived experiences in the new lease of life [4].

Studies show significant improvement in the quality of life among kidney transplant recipients. The improvement in the quality of life is even more satisfying if the recipients return to their normal official duties [5]. However, the post transplant period brings a lot of stress in the recipient patients and health care professionals are required to understand the perceptions and lived experiences of patients living with kidney transplant in order to adequately handle their social, physical and emotional concerns. By acquiring such insights, health care professionals can implement relevant strategies that can bring significant improvement in the quality of life for the patients.

This qualitative study was therefore set out to explore the perceptions and lived experiences of kidney recipient patients in Shanghai, China.

2. Methodology

2.1. Study Design

The study was a qualitative one and mainly utilized phenomenological approach. This qualitative study used in-depth interview approach to interview kidney recipient clients in order to gain in-depth understanding of their perceptions and lived experiences in the post transplant period. The design was appropriate for the study because its purpose was to describe the perceptions and lived experiences of the kidney recipient participants [6].

2.2. Study Setting

The study was conducted in Shanghai, China. A renal department at one of the tertiary hospitals formed the study site.

2.3. Study Participants

The participants were identified through purposive sampling by the health care worker who was attending to them during the clinic review visits. The participants were briefed about the study and voluntarily consented to participate in the in-depth interviews. A total of 5 kidney recipient patients participated in the study.

2.4. Inclusion and Exclusion Criteria

The study recruited participants who had lived with a kidney transplant for a period of one year or more and those who lived with a transplant less that a minimum period of a year were excluded. The participants were supposed to be clinically stable and those not clinically stable were excluded as well. The participants who refused to give consent for participation were also not included in the study.

2.5. Data Collection

Five in-depth interviews were conducted. Prior to each interview session, the study participant was provided a guide on the process of the interview and informed consent was obtained. All the interview sessions were audio recorded and each session of the interview lasted 25 to 35 minutes on average. The questions for the interview surrounded patient perceptions and lived experiences living with a transplant. Facilitation of the interviews was through active listening, paraphrasing and probing when required was also utilized.

2.6. Data Analysis

Data was analyzed using Nvivo soft ware. The researcher and assistant researcher listened to the recorded interview sessions and the interviews were transcribed verbatim. Repetitive reading of transcribed data lead to code development and then data categories were grouped and major themes were developed. The transcripts were shared with another independent researcher to separately come up with the codes. Differences that emerged were discussed and resolved.

2.7. Ethical Clearance

Ethical clearance was obtained from department of medical anthropology Fudan University and the hospital management and renal department at the site of the study. The participants were given details of the study prior to their participation and informed consent was obtained. They were given the freedom to take part and were free to withdraw at any time without any penalty. The principles of autonomy and anonymity were upheld throughout the study and no participant's identifiers were to be attached in research documents and publication reports.

3. Findings

3.1. Characteristics of the Study Participants

The study included clinically stable kidney recipient clients. There were five clients in

total, their ages ranged from 25 to 45 years. There were 3 females and 2 males altogether and the participants had lived with the kidney transplant for a period of a year to nine years. They were all working or business class people.

3.2. Themes

The findings revealed overall improved quality of life among recipients and that kidney transplant patients under go vast experiences and life adjustments post kidney transplantation procedure. The findings indicated that kidney recipients are subjected to a lot of psychosocial stress with the kidney terminal disease and as they live with the new organ in the post transplantation period. The main findings have been summarized under two predetermined themes and several sub themes. The major themes are psychosocial stress and client lived experiences.

3.2.1. Psychosocial Stress

The findings revealed that all the participants experienced some levels of stress from the onset of symptoms of the condition to post kidney transplantation period. The symptoms which were experienced prior to the diagnosis of the problem included headache, fatigue, shortness of breath, poor appetite, sleeplessness and high blood pressure. All the participants indicated that they did not know these as the symptoms of kidney disease;

No clear meaning, just knew it is a disease. (Female, 32 years)

And;

Not special. I did not know. (Male, 25 years)

3.2.2. Activity before Seeking Medical Care

The findings showed that most of the participants did not know what to do when they saw the symptoms. This could be one of the factors for the stress that they experienced. The participants' excerpts on this included;

I did nothing, but I visited several hospitals before I was told that I have a chronic kidney disease. (Female, 32 years)

Another one added;

I sought advice from a relative who is a doctor. (Female, 36 years)

Another participant further stated that she sought care from traditional Chinese hospital;

I visited traditional Chinese medicine hospitals for two years. I have been receiving herbals and I hope it helped quite well. (Male, 33 years)

One participant hinted that he thought had a disease of the stomach and visited several hospitals before he was told of the kidney problem;

I thought it was a disease of the stomach. I visited several hospitals and at one hospital they transferred me to cardiac department then it was found that I have a problem with kidney and I underwent dialysis. (Male, 25 years)

3.2.3. Causes of the Problem

The findings showed that the participants had mixed views/perceptions on the causes

of their condition. The participants said;

Genetic deformity disease because my mum also had it (Female, 32 years)

Another participant added;

I just think could be irregular sleep pattern, new house and toxins from furniture and environment as well as new house pollution. (Female, 45 years)

Two of the participants thought that their kidney problem was due to prematurity and they had the following excerpts;

I was a premature child with low birth weight, no breast milk. I always had a condition of anaemia, easily attacked by other diseases and thought this could be related to renal problem. (Male, 33 years)

And;

I was born prematurely with low birth weight. I always eat roasted food, nodules three to four times a week. (Male, 25 years)

3.2.4. Feelings of Being Responsible for the Problem

The findings revealed that the majority of kidney recipient clients thought they were responsible for the problem. This could have increased their levels of stress and the clients had the following excerpts on this;

In Shanghai a lot of pressure, pressure of work, I could skip my diet. Some signals I ignored them which I think could be related to my problem. (Male, 33 years)

And another participant said;

I feel responsible for the problem; *I eat a lot of roasted food*. (Male, 25 years)

Another one was skeptical on whether was responsible for the problem;

Maybe, because of my life style and the environment I was living in. (Female, 45 years)

3.2.5. Problem Seriousness

The findings showed that the majority of the clients perceived the problem as very serious and this subjected them to a lot of stress. The clients' excerpts were;

It's a *terrible, very serious condition*; *usually I had high blood pressure and heart failure*. (Male, 33 years)

And another added;

It is very serious; *I cannot sleep well at night. I just went to hospital and obeyed the prescription*. (Male, 25 years)

One participant emphatically stated that she was very puzzled realizing she had the condition;

Very serious and I was puzzled, just went to hospital. (Female, 45 years)

3.2.6. Effect of Problem on Body and Mind

The participants were asked to describe the effect of the condition on their body and mind. Some participants perceived it as a source of sadness and caused them to lose concentration. This greatly affected their personal sense of self;

Sadness, I thought it was unacceptable and very sad. (Female, 32 years)

Another client stated;

No concentration, no innovation, I do not have any zeal to do things. (Male, 25 years)

The other participant also added that the problem made her lose hope;

Grey day; *it brought grey day experience*; *no hope and no energy to do things*. (Female, 45 years)

3.2.7. Meaning of the Diagnosis

The knowledge of the diagnosis brought a lot of anxiety in the clients. The findings showed that the participants experienced a sense of denial and helplessness upon the knowledge of the diagnosis;

Sadness, felt like the sky is falling down on me. It was unacceptable, I did not accept it. I thought it was dangerous, I felt it would take my life. I did not worry about the treatment since the side effects of the treatment could be controlled. I got my kidney from my father and I am worried about him, I have to work and support the family. (Female, 32 years)

And another;

Unacceptable, I had to undergo attitude adjustment and without excuses had to accept it and see how to treat it. (Male, 33 years)

The other client stated that to her the meaning was that she will be a dependent person as she will not be able to work because of the problem;

To me the meaning was no work anymore because I was feeling too tired. (Female, 45 years)

Another client also reported instances of stigma, so to such clients the diagnosis meant stigmatization in society;

I got a job and the company abandoned me because of stigma and for me to get another job it is problematic. I also fear death and drug side effects though I feel side effects will be managed by doctors. (Male, 25 years)

3.3. Lived Experiences

The findings showed that the clients had varying reactions and treatment of the new organ and that most of them experienced financial problems in meeting the cost of the treatment;

Cost of treatment is very expensive. (Female, 32 years)

Another client added;

Treatment is very expensive, but I am trying. (Male, 33 years)

Furthermore another one stressed;

Expensive, treatment is expensive. (Male, 25 years)

3.3.1. Reaction to New Organ and Treatment of New Organ

The findings revealed that the clients reacted differently to the new organ. Majority of the clients described getting a new organ as a cherishable experience;

Cherish, treasure it. I regard it as a treasure and cherish it very much. I use hands to shield and protect it. I have a prudent attitude regarding the care of my new kidney. (Female, 32 years)

And another stated;

I cherish it very much. I knew the new kidney will give me new life. I visit the clinic monthly to check on my kidney function. The advice is once in three months. (Female, 36 years)

And another further added;

Surprise; *I cherish it very much, very important for me to live and I did not wait to come to hospital for the operation. I treasure it so much*. (Female, 45 years)

However, one participant, contrary to what the majority stated, described getting a new organ as an unacceptable experience;

Unacceptable, did not want it, I got it from my mum after discussions because I was refusing it. It was like she was giving birth to me for the second time. I protect it, no compression and regularly taking medications without stopping to avoid trauma to the new organ. (Male, 25 years)

3.3.2. Lived Experiences with New Organ

The participants acknowledged that with the new organ life was not the same any more. It had a lot of restrictions in order to safe guard the transplant. However, the majority of the participants reported improved quality of life with the new organ;

I am not tired any more. I am more and more active than before. (Female, 36 years)

And another stated;

A little improvement; *Diet habit has changed*; *more meat less vegetables, chicken and duck*. (Male, 33 years)

Another client stressed on the improved quality of life;

My life has changed a lot; *I sleep peacefully, no more overworking. My diet has changed*; *more vegetables and I do more exercise-walking*. (Male, 25 years)

One participant stated that she was now living a normal life with the new organ;

Now normal life, I am much healthier than before, much more regular and I do exercises. (Female, 45 years)

3.3.3. Shared Experience

The participants were asked to share their lived experiences outside the hospital clinic setting when they are in their society on how they take care of themselves. Majority of the clients reported that they are in social net work groups where they discuss and share information regarding their problem;

I am in a kidney recipient group where results are communicated and the doctor gives advice. I am also in a wechat group where we communicate and share a lot of information regarding our condition. (Female, 32 years)

Another participant added that he has a plan to increase public awareness of kidney disease and he had the following excerpt;

Not only to share but I have a business proposal to develop a public software to spread the kidney disease messages by myself including funding the project. I developed a group club of patients who have undergone kidney transplant procedure. The results are sent to the group and there is a doctor for advice. (Male, 33 years)

4. Discussion

Quality of life for recipients in the post kidney transplant period is subjected to a lot of psychosocial stress [3]. A number of factors influenced stress in the current study and they included lack of knowledge on the condition, thoughts of being sorry for the relative kidney donor, un affordability of available treatment, drug side effects, adjustment of the personal self and blame for the self as well as the feelings of being responsible for the kidney loss.

The clients living with a transplant experience new challenges in the post transplant period, such challenges include a span of chronic infections, life course of complex medications and fear of death [7]. These challenges demand that these clients should acquire knowledge on their condition in order to effectively take good care of self in the post transplantation period.

This current study reflected a gross lack of knowledge of the condition among the clients from the conception of condition symptoms as well as in the post transplantation period. This lack of knowledge in the pre surgical period may have caused a lot of anxiety in the clients as they were victims of fear of unknown. This calls for effective education strategies to improve public awareness of chronic kidney disease. It is also recommended that the patients who have undergone kidney transplantation procedure should be exposed to effective education regarding their self care in the post transplantation period.

The study also revealed lack of knowledge on health promotion activities in the post transplantation period. The clients in this study had low levels of knowledge of self care practices such as monitoring of vital signs, dietary adjustment (low salt diet), regular exercises, good hydration status and realization of potential risks of infections. This poor knowledge would mean that the patients self management in the post transplant period was full of inadequacies. However, the findings revealed that the participants were adherent to drugs, which was good in preventing infections but this needed to be complimented with good and efficient self care practices. Inadequate self care practices among kidney recipient clients have also been reported in other studies. In a study by Gordon *et al.* 2009 [8], to explore self care strategies and barriers among kidney transplant recipients, it was found that few kidney recipient patients followed optimal self care practices regarding personal hydration and physical exercise. It was also reported in this study that most of the patients faced challenges on self care, one of them being that they were not sternly advised to do so by the health care providers. Similarly another study also found lack of knowledge on self care after kidney transplantation as a main factor that affected patient outcomes in the post transplantation period [9].

The findings also revealed that the main sources of stress were poor knowledge on the condition, feelings of self blame on the cause of the problem, denial of the diagnosis, perceived severity of the problem, cost of treatment, medication side effects as well as the fear of loss of life due to the problem. This meant that the psychosocial stress that the clients experienced mainly originated from the lack of knowledge on the condition and lack of knowledge on self care practices. The individual participants described the

ways which they used to reduce levels of stress such as not thinking too much about the problem, sticking to the doctor's prescription, drug adherence and by joining social network groups and sharing information regarding their problem. Similarly, it was observed in another study that the participants coped with stress by blocking thoughts regarding their illness [10]. What the participants outlined in the current study on stress management lacked content on effective self care practices. This therefore calls for immediate implementation of effective awareness strategies in order to mitigate this knowledge gap to significantly reduce the levels of psychosocial stress among the clients and maximize good patient outcomes. In a study by Orr *et al.* 2007, [11], fear was also found to be a main source of stress. The kidney recipient clients despite experiencing a considerable improvement in the quality of life, they experienced strong fear that the new kidney would fail at some point. This made them to perceive eminent death rooming and it is reported in the same study that clients were prepared for this tragic moment. In another study conducted in Norway, kidney recipient clients described kidney transplantation as a turning point in life that brought severe learning difficulties because of high levels of both physical and mental stress. The clients in the study expressed the need for a supportive learning atmosphere with continued learning as critical to a successful post transplantation period [12].

Literature has shown significant improvement in the quality of life for kidney transplant patients [5] [13]. Similarly, in this current study all the participants indicated great improvement in the quality of life in the post transplantation period though this improvement was individual based. Majority of the participants stated that their life was now healthier than before and that they were more active than before. They described their status as a cherishable situation and that the new kidney has given them new hope and new chance to live again in the new lease of life;

I cherish, treasure the new kidney. I regard it as a treasure and cherish it very much. I use hands to shield and protect it; *I have a prudent attitude regarding the care of my new kidney*. (Female, 32 years)

And another participant stated;

I am not tired any more. I am more and more active than before. (Female, 36 years)

However, the improvement in the quality of life among the clients did not have a parallel rise in self awareness regarding effective self care practices so that it could be realized to its maximum potential.

5. Study Limitation

The interviews were conducted in a mixture of Chinese and English languages. This may have affected the richness of the data as data may have been lost during transcription however the recordings were supplemented with the notes taken during the in-depth interviews.

6. Conclusion

The findings highlighted some useful insights regarding perceptions and the lived ex-

periences of kidney recipient patients. Though all the participants reported improved quality of life in the transplantation period, the findings revealed participants' low levels of knowledge on their condition and self care practices in the post transplant period. This subjected the participants to a multitude of psychosocial stress. Therefore, there is a need to implement effective patient education programs to improve patient awareness on the problem and improve awareness on self care practices among the recipients. The failure to do so would subject the recipients to enormous psychosocial stress thereby negatively impacting on the quality of life in the post transplant period [14]. Further research is recommended to explore the perceptions and lived experiences in the long time transplant recipients. Studies should also be conducted to explore the effectiveness of education strategies used for teaching the transplant recipients.

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Conflict of Interest

There is no conflict of interest involved in this study.

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Epidemiological Profile of Chronic Kidney Disease at the General Hospital of National Reference of N'Djamena (Chad)

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Abstract

Introduction: Chronic renal failure is a disease that affects many patients worldwide and increasingly in Africa. At the end of 2003, about 1.1 million people were suffering from End-Stage Renal Disease (ESRD) and were treated with periodic dialysis [12]. In Africa, CKF represents 2% to 10% of hospital admissions and is responsible for 4% to 22% of deaths [14]. So, this study is conducted for the first time in Chad, with the aims to determine the prevalence of CKD. **Methods:** This was a retrospective, descriptive and analytical study over a period of 12 months from April 29, 2011 to April 28, 2012. All patients with chronic renal failure regardless of etiology and stage of chronic kidney disease were included in the study. Chronic renal failure was defined as a glomerular filtration rate below 60 ml/min/1.73m (MDRD) for more than 3 months. This study was conducted in several departments of the National General Reference Hospital (NGRH) of N'Djamena. **Result:** Among 2039 inpatients, 195 patients had chronic renal failure, as a frequency of 9.6%. The average age of our patients was 51 ± 16.8 years, ranging from 11 to 85 years. Male predominance was noted to be 59% of men against 41% of women. We noted that high blood pressure accounted for 66.2% (N = 129) of cases, diabetes in 48.2% (N = 94), alcoholism in 28.7% (N = 56), smoking in 14.9% (N = 29) and the association alcoholism-smoking in 19.5% (N = 38). Hypertension was the leading cause of chronic renal failure (66.2%). All patients had a serum creatinine and creatinine clearance was assessed. Among them, we noted 57 patients (29%) with end-stage renal failure. The average calcium and phosphate serum were 1.8 mmol/l and 1.6 mmol/l, respectively. We

noted that 120 patients as 61.5%, currently took herbal medicine. 48 out of 57 of our patients with ESRD as 24.6% of patients in the study had received replacement therapy (hemodialysis) with 12.5% of deaths. **Conclusion:** Chad, who compiled the first study with 195 patients at the General Hospital of N'Djamena National Reference over a period of one year has objectified a prevalence of chronic renal failure of 9.6%.

Keywords

Chronic Kidney Disease, Epidemiology, N'djamena, Chad

1. Introduction

Chronic kidney disease is a major public health challenge in terms of social and human costs [1]. The number of patients with chronic kidney disease increased in a major way in the world over the past decade. Worldwide at the end of 2003, about 1.1 million people were suffering from End-Stage Renal Disease (ESRD) and were treated with periodic dialysis [2]. In France, there were 37,430 patients treated by dialysis in 2010 (an increase of 12% since 2006), a prevalence of 720 per million population [3]. In Africa, CKF represents 2% to 10% of hospital admissions and is responsible for 4% - 22% of deaths [4]. In Côte d'Ivoire, at the internal medicine department of CHU Treichville, it was the second cause of death with a prevalence of 6.14% [4]. In Senegal, the hospital incidence is estimated at 87 new cases per year [5]. In Chad, we do not have any statistics on kidney disease. The first unit of Nephrology-Hemodialysis was born in 2011. Kidney diseases are under diagnosed and patients were seen in specialized nephrology consultation at chronic renal failure indeed end stage. That's why we initiated this study whose objectives were to determine the epidemiological profile of patients with chronic renal failure. This study had been conducted within the General Hospital of National Reference in N'Djamena over a period of one year (2011-2012). Level 3 hospital with 260 beds is the biggest hospital in Chad.

2. Material and Methods

This was a retrospective, descriptive and analytical study over a period of 12 months from April 29, 2011 to April 28, 2012. Were included in the study, all patients with chronic renal failure regardless of etiology and stage of chronic kidney disease. Chronic renal failure was defined as a glomerular filtration rate below 60 ml/min/1.73m (MDRD) for more than 3 months. This study was conducted in several departments of the National General Reference Hospital (NGRH) of N'Djamena: cardiology, infectious disease and nephrology. The NGRH is a national public health reference (level) III facility with a capacity of 260 beds located in the capital N'Djamena, Chad. This is the second reference nephrology department of the country. Nephrology department staff consists of two nephrologists, a general practitioner and three interns. The renal unit further includes a hospitalization sector equipped with 8 beds. The parameters studied

were epidemiological, clinical, biological and therapeutic. The qualitative variables were represented by gender, occupation, risk factors and clinical signs. Quantitative variables were represented by age, different stages of CKD and biochemical exams: hemoglobin, serum phosphate, serum calcium, uric acid. These data were collected using a survey according to patient records. Some patients have been contacted if their file was incomplete with their prior consent. Were excluded from the study, all patients with acute renal failure and those who didn't give their consent. Data were entered and analyzed using SPSS 18 software and were processed by univariate bivariate analysis.

3. Results

During this period, 2039 patients were hospitalized for kidney failure in the various service of the GHNR. Among them, 195 patients had met the inclusion criteria as 9.6% of cases. The other patients were not selected because they presented acute renal failure which have recovered, had incomplete files or had not or had not given their consent.

3.1. Sociodemographic Parameters

3.1.1. Age

The average age was 51.8 ± 16.8 years and extreme ranging from 11 years to 85 years. The age group between 45 to 64 years accounted for 44.10% of all cases. Distribution according to ages is summarized in Figure 1.

3.1.2. Gender

Our study population consisted of 114 men and 81 women with a sex ratio of 1.4.

3.2. Clinical Characteristic

We noted that 54.4% of patients were hospitalized in cardiology as shown in Figure 2.

3.2.1. Risk Factors

We noted that high blood pressure account for 66.2% (N = 129) of cases, diabetes

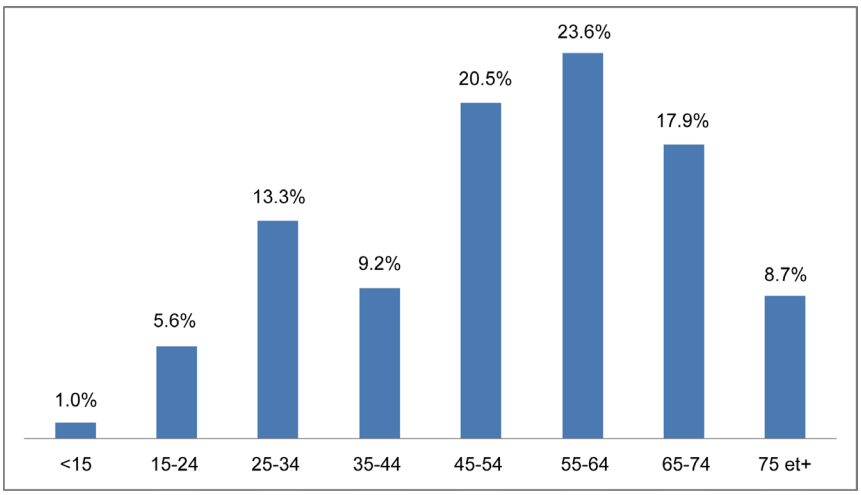

Figure 1. Distribution of patients according to age group.

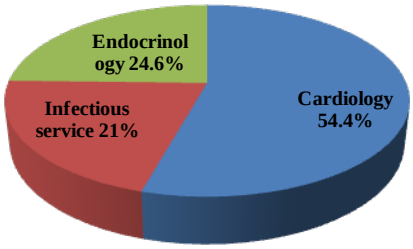

Figure 2. Distribution of patients according to specialties.

in 48.2% (N = 94), alcoholism in 28.7% (N = 56), smoking in 14.9% (N = 29) and the association alcoholism-smoking in 19.5% (N = 38).

3.2.2. Stages of Chronic Kidney Disease

We noted in **Figure 3** that 57 of 195 registered patients as 29% had end-stage renal disease (Stage V).

3.2.3. Distribution of Age according to CKD Stages

In the proportion of 57 (29%) patients in CKD5, 44 patients were aged between 25 and 64 years as 77.20%. The rest of the results is summarized in **Figure 4**.

3.3. Paraclinical Parameters

The average calcium and phosphate serum were respectively 1.8 mmol/l (standards laboratory for normal serum calcium is between 2.2 and 2.6 mmol/l) and 1.6 mmol/l (standards laboratory for normal serum phosphate is between 0.8 and 1.45 mmol/l).

Parathyroid hormone and 25-OH vitamin D were not dosed at General Hospital of national reference.

Table 1 summarizes the main measured biological parameters.

3.4. Therapeutic

We noted that 120 patients (61.5%), were taking herbal medicine as shown in **Table 2**. There was 5.7% (N = 11) of patients taking the native vitamin D (25 OH vitamin D) and 61.4% (N = 119) who had a calcium supplementation as calcium carbonate. 48 out of 57 of our patients with ESRD (24.6%) in the study are treated with chronic conventional hemodialysis at 2 session of 5 hours per week.30 patients hemodialysis with arteriovenous fistulas, 8 patients through tunneled catheters and 10 patients with non-permanent central catheters. Among these patients, there were 12.5% of death.

4. Discussion

This work is the first step of a series. It shows that the epidemiology of chronic renal failure in the General Hospital national reference was 9.6%. The results were set out overall. This work is limited by the small sample and the absence of multivariate analysis. The variables need to be expanded especially to socio-professional data, risk factors, namely smoking, alcoholism and paraclinical data such as ultrasound and lipid profile.

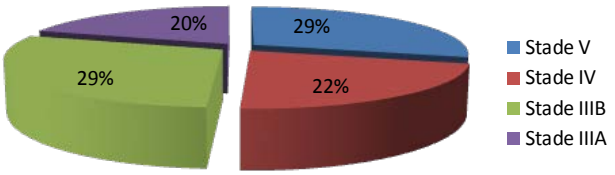

Figure 3. Distribution of patients by stage of CKD.

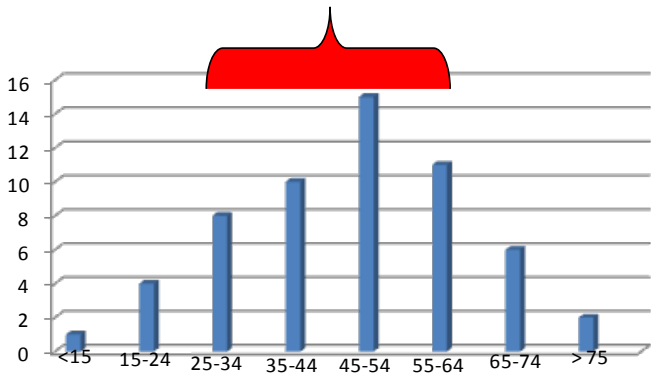

Figure 4. Distribution of age according to CKD stages.

Table 1. Measured biological parameters.

	Hemoglobin (g/dl)	Serum calcium (mmol/l)	Uric acid (µmol/l)	Phosphate levels (mmol/l)
Average	10.5	1.8	678	1.6
Standard deviation	3.7	0.2	256.7	0.8
Minimum	05	1.4	190.0	0.7
Maximum	17	2.2	1398.0	3.4

Table 2. Distribution of patients according to treatment received before hospitalization.

Treatment	Number	Percentage (%)
Herbal medicine	120	61.5
Antihypertensive drugs	25	12.8
Antidiabetic drugs	20	10.3

Etiologies of CKD should be incorporated. The average age of our patients was 51.8 ± 16.8 years, ranging from 11 - 85 years. In bivariate analysis, the age group of 45 - 74 years was the most affected by IRC, as 62% of cases. It follows that the affected population is young and the results are similar to those found in some studies in Africa [6] [7]; by against the results noted in some developed countries showed that patients affected by IRC have an average age above 60 years [8] [9]. This discrepancy is explained by the fact that in Western countries there is greater access to care, preventive means and could diagnostic performance, a management of patients with faster and more adequate renal failure.

Sex ratio was 1.4. The same result was observed in most studies [8] [9]. It was noted a higher proportion of patients hospitalized in cardiology (54.4%). This could be explained by the fact that a large majority of patients in the study were hypertensive and diabetic. Those two pathologies are providers of pericardial and renal dysfunction. Hypertension was found in 129 patients (66.2%). It is the leading cause of vascular nephropathy and therefore represents one of the main etiologies of CKD in our study. It is as an essential factor of renal disease progression. His balance is essential to stabilize the chronic renal failure. However, we noted that only 25 hypertensive patients (12.8%) were on antihypertensive treatment. This low patients treaties is explained by the low socioeconomic level to buy medicines, to poor adherence and local beliefs that would guide patients to use traditional herbal medicine.

Diabetes is the second leading cause. This shows the role of diabetes in the onset of diabetic nephropathy which is one of the causes of CKD in our study. Studies conducted in France and the United States of America had found that the most frequent cardiovascular risk factor was diabetes [8] [9].

These backgrounds are known to be important factors for onset or worsening of CKD [10]-[12].

The primary cause of CKD varies among studies, and can be nephroangiosclerosis [13], diabetic nephropathy or chronic glomerulonephritis [14]. The variation reflects differences in the prevalence of kidney disease among countries.

These increases indicate the severity of the loss of renal function of patients. The end stage renal disease accounted for 29% of cases. This often explains the delay of initial diagnosis of CKD.

Forty-eight out of 57 of our patients with ESRD hence 84.2% had received chronic intermittent hemodialysis. The recommended frequency of hemodialysis sessions is three per week. But two sessions per week were set for most cases due to lack of hemodialysis generators. Ideal for vascular access in hemodialysis is that all chronic hemodialysis patients must have an arteriovenous fistula. But in our study, few patients were receiving dialysis arteriovenous fistula by venous. This is due to a faulty technical platform. Kidney transplant was not performed in any of patients in our series.

During our management in hemodialysis 12.5% of our patients died in a state of poor adherence to lifestyle modifications and therapy and because of severe uremia, advanced kidney disease diagnosed at advanced stage and under dialysis.

Vitamin D are three types of effects on the vascular system: anti-inflammatory, reducing myocardial hypertrophy, inhibition of the renin-angiotensin system. Thus treatment with a form "inactive" of vitamin D, or 25(OH)D is a new approach for patients with CKD. There was a very small proportion of patient (5.7%) was in vitamin D. This is due to the fact that the molecule does not exist on the local market.

5. Conclusion

Chronic kidney disease is a silent and long disease. In Chad, at General Hospital of National Reference, the proportion of CKD patient is 9.6%. We noted that 30% of CKD

patients were in end-stage renal disease. Despite the growing number of chronic renal insufficient patients in Chad, their care, as in most African countries still suffers lack of specialized structures. Reducing the morbidity and mortality of this condition requires early diagnosis and management of cardiovascular risk factors. This work is limited by the small sample and the absence of several clinical and paraclinical parameters for multivariate analyzes. In future prospects, this study will be extended to other peripheral hospitals in N'Djamena and other cities in order to obtain more representative results.

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Abbreviations

CKD: Chronic Kidney Disease;
CKF: chronic Kidney Failure;
ESRD: End Stage Renal Disease;
GHNR: General Hospital of National Reference;
MDRD: Modification of Diet in Renal Disease.

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A Case of Acute Renal Failure Associated with IgG4-Related Disease Presenting Both Tubulointerstitial Nephritis and Retroperitoneal Fibrosis

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Abstract

We report a case of IgG4-related disease presenting both tubulointerstitial nephritis and retroperitoneal fibrosis causing acute renal failure in a 63-year-old male. He was admitted to our hospital because of acute renal failure requiring emergent hemodialysis. Computed tomography showed a soft-tissue density mass with an irregular border in the retroperitoneum. The mass involved bilateral ureters and had caused acute renal failure by bilateral hydronephrosis. Because of a history of uveitis and high IgG4 levels, we considered a diagnosis of retroperitoneal fibrosis, IgG4-related disease. Kidney biopsy revealed IgG4-related kidney disease with interstitial nephritis. After relief of urinary obstruction by inserting ureteral catheters into the bilateral ureters, renal function recovered.

Keywords

IgG4 Related Disease, IgG4 Related Tubulointerstitial Nephritis, Retroperitoneal Fibrosis, Acute Renal Failure

1. Introduction

IgG4-related disease (IgG4RD) is a relatively rare autoimmune disorder associated with elevated serum IgG4 concentration, lymphoplasmacytic infiltrate of IgG4-positive plasma cells, and storiform fibrosis in various organs including the kidneys and retroperitoneum [1]. We present a case of IgG4RD presenting both tubulointerstitial neph-

ritis and retroperitoneal fibrosis causing acute renal failure.

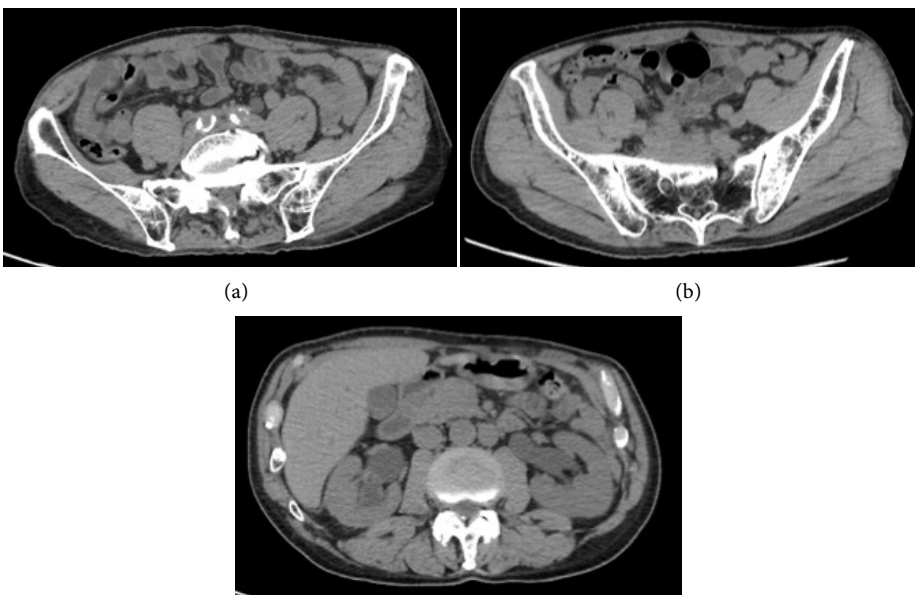
2. Case Report

A 63-year-old male, who was diagnosed as having uveitis in another ophthalmological clinic, was admitted to our hospital because of acute renal failure. He also documented fatigue and dysuria. He had no particular prior medical history. On admission, laboratory tests showed deterioration of renal function (BUN, 68.5 mg/dL; creatinine, 6.1 mg/dL; estimated glomerular filtration rate (eGFR), 8 mL/min/1.73m^2), increased serum total protein, proteinuria (2.54 g/day) and negative for hematuria in urinalysis (Table 1). Urinary N-acetyl-beta-D-glucosaminidase (NAG) and beta 2-microglobulin

Table 1. Laboratory data.

(CBC)	Result	Reference	(Immunity)	Result	Reference
WBC	8030/μL	3500 - 9700/μL	IgG	2442 mg/dL	820 - 1740 mg/dL
RBC	414 × 10^4/μL	438 - 577 × 10^4/μL	IgG4	240 mg/dL	4 - 108 mg/dL
Hb	13.4 g/dL	13.6 - 18.3 g/dL	IgA	491 mg/dL	90 - 400 mg/dL
Plt	18.6 × 10^4/μL	14.0 - 37.9 × 10^4/μL	IgM	73 mg/dL	31 - 200 mg/dL
(Coagulation)			ANA	(−)	(−)
PT-INR	1.08	0.90 - 1.13	ESR	53 mm/hr	<15 mm
APTT	55.1 sec	26.0 - 38.0 sec	ACE	7.7 U/L	7.0 - 25.0 U/L
(Biochemistry)			MPO-ANCA	(−)	(−)
TP	8.6 g/dL	6.5 - 8.2 g/dL	PR3-ANCA	(−)	(−)
Alb	4.1 g/dL	3.7 - 5.5 g/dL	Anti-GBM	(−)	(−)
T-Bil	0.3 mg/dL	0.3 - 1.2 mg/dL	Cryoglobulins	(−)	(−)
AST	9 IU/L	10 - 40 U/L	C3	113 mg/dL	80 - 140 mg/dL
ALT	7 IU/L	5 - 45 U/L	C4	27.0 mg/dL	11.0 - 34.0 mg/dL
LDH	153 IU/L	120 - 245 U/L	CH50	41 IU/mL	30 - 45 IU/mL
T-Cho	130 mg/dL	150 - 219 mg/dL	(Urinalysis)		
TG	51 mg/dL	50 - 149 mg/dL	pH	6.0	7.380-7.460
Amy	73 IU/L	39 - 134 U/L	Up	(2+)	(−)
BUN	68.5 mg/dL	8.0 - 20.0 mg/dL	Ub	(3+)	(−)
Cr	6.10 mg/dL	0.65 - 1.09 mg/dL	NAG	9.1 U/L	0.0 - 10.0 U/L
UA	9.6 mg/dL	3.6 - 7.0 mg/dL	β2MG	491 μg/L	<250 μg/L
Na	136 mEq/L	135 - 145 mEq/L			
K	5.9 mEq/L	3.5 - 5.0 mEq/L			
Cl	110 mEq/L	98 - 108 mEq/L			
Ca	9.1 mg/dL	8.6 - 10.2 mg/dL			
IP	4.8 mg/dL	2.5 - 4.5 mg/dL			
CRP	0.37 mg/dL	<0.30 mg/dL			
HbA1c	5.20%	4.6% - 6.2%			

levels were 9.1 U/L and 491 μg/L, respectively. C-reactive protein was 0.37 mg/dL and erythrocyte sedimentation rate was 53 mm/1h. Serum IgG level was high (2442 mg/dL), whereas serum levels of IgA and IgM were within normal limits (491 mg/dL and 73 mg/dL, respectively). Further analysis of IgG subclasses revealed a high IgG4 level (240 mg/dL). Serum angiotensin-converting enzyme (ACE) was 7 U/mL. There was no hypocomplementemia (C3, 113 mg/dL; C4, 27.0 mg/dL; CH50, 41 U/mL). Anti-nuclear antibody, myeloperoxidase anti-neutrophil cytoplasmic antibody (ANCA), proteinase-3 ANCA, anti-glomerular basement membrane antibody, and serum cryoglobulins were within normal ranges. A physical examination revealed no significant abnormalities. His chest and abdomen were intact and edema was not seen in his extremities. Computed tomography scanning showed a soft-tissue density mass with an irregular border in the retroperitoneum. The mass involved bilateral ureters and had caused bilateral hydronephrosis leading to acute postrenal failure (**Figure 1**). Because of a history of uveitis and high IgG4 levels, we considereda diagnosis of retroperitoneal fibrosis. Ga scintigraphy revealed no radionuclide uptake (**Figure 2**). Salivary gland biopsy showed no significant abnormalities. Kidney biopsy showed diffuse lymphoid infiltration and fibrosis. Furthermore, immunohistochemistry showed that 20% - 30% of the plasma cells were IgG4-positive. In absolute numbers, >10 IgG4+ plasma cells were seen per HPF (**Figure 3**). Based on the results of a renal biopsy, the patient was diagnosed ashaving IgG4-related kidney disease (IgG4RKD). Because of acute renal failure, emergent hemodialysis was performed. After relief of urinary obstruction by inserting ureteral catheters into the bilateral ureters, renal function recovered (**Figure 4**). Oral prednisolone was administered at a dose of 40 mg daily, and serum IgG4 level improved



(a) (b)

(c)

Figure 1. Computed tomography showed a soft-tissue density mass with an irregular border in the retroperitoneum (a)-(b). The mass involved bilateral ureters and had caused bilateral hydronephrosis (c).

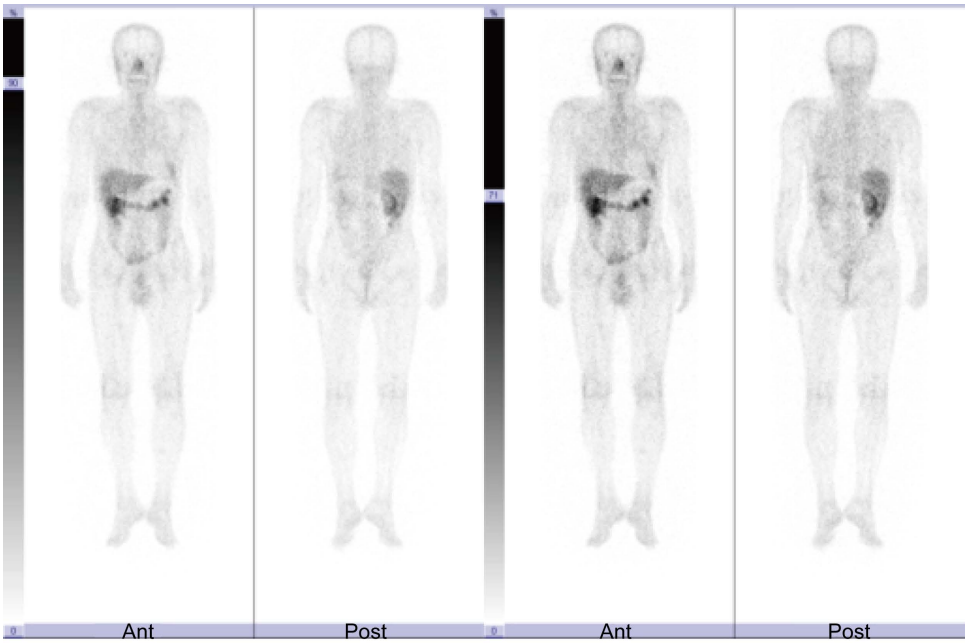


Figure 2. Ga scintigraphy revealed no radionuclide uptake.

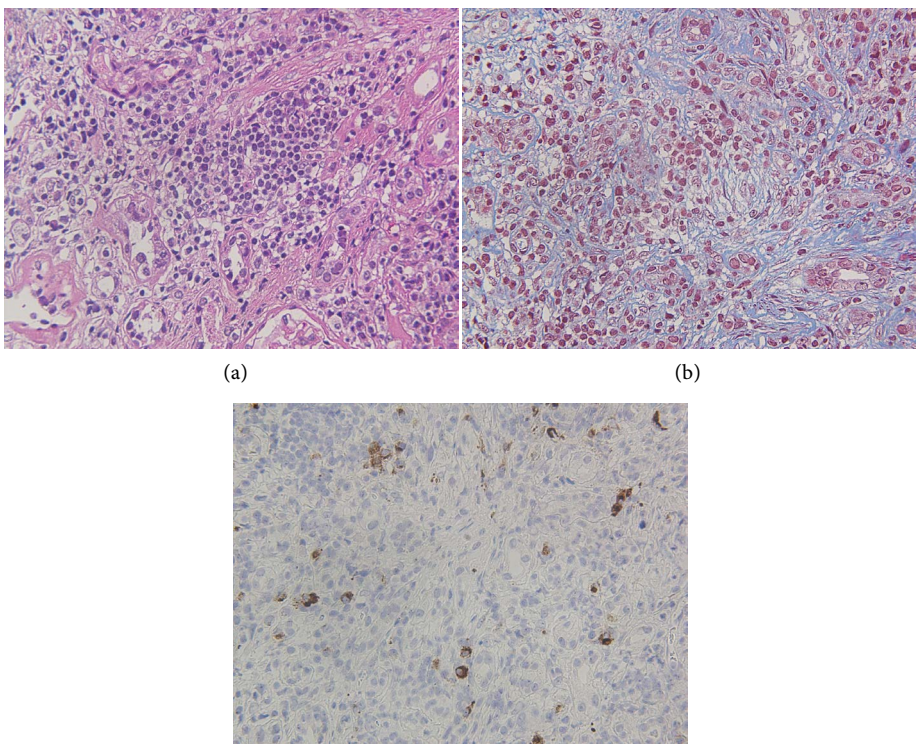


Figure 3. The infiltrate was predominantly composed of lymphocytes and plasma cells ((a), hematoxylin and eosin staining). Collagen fibers encircled the inflammatory cells ((b), Masson trichrome staining). The IgG4/IgG-positive plasma cell ratio was 20% - 30%. In absolute numbers, >10 IgG4+ plasma cells were seen per HPF. IgG is depicted in blue and IgG4 is depicted in brown ((c), IgG immunostaining).

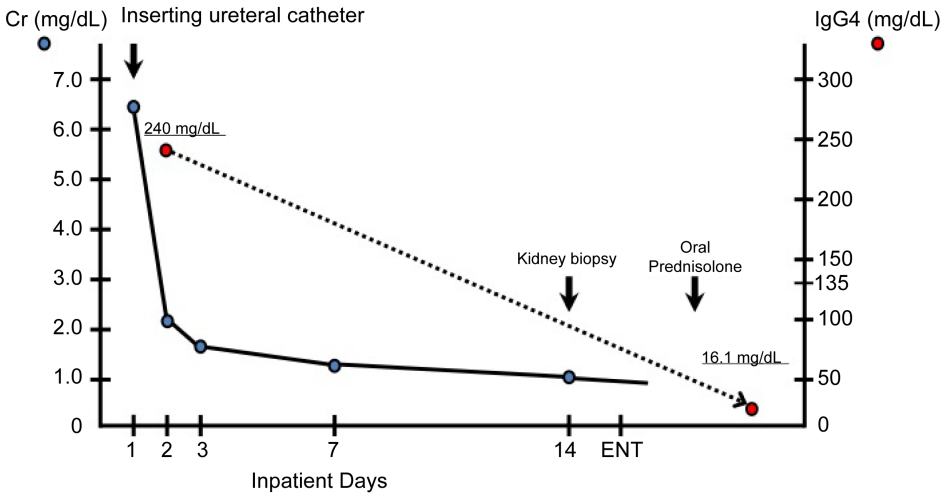


Figure 4. Clinical course.

gradually to 16.1 mg/dL. He is followed up carefully and currently continued prednisolone thereafter on a tapering dose.

3. Discussion

IgG4RD is a multi-organ disorder characterized by infiltration of IgG4-positive plasma cells in various organs with a high level of serum IgG4. The disorder was first reported in 2001 in patients with autoimmune pancreatitis [2] and was subsequently confirmed in other organs including the salivary glands, hepatobiliary tract, lymph nodes, lungs, retroperitoneum and kidneys. IgG4RKD was first reported in 2004 as a tubulointerstitial nephritis associated with autoimmune pansreatitis [3] [4]. IgG4RKD mainly manifests as plasma cell-rich tubulointerstitial nephritis (TIN) with increased IgG4+ plasma cells and fibrosis. In a study of 153 patients with suspected IgG4RD, retrospectively collected from multiple medical centers in Japan, 23 patients (15 percent) were identified with TIN secondary to IgG4RD, all but one of whom (96 percent of TIN patients) exhibited involvement of other organs [5]. The mean age at diagnosis of the reviewed cases was 65 years, and 73% - 87% of the patients were men [6]. Patients with IgG4RD have an increased prevalence of allergic rhinitis and bronchial asthma [7], therefore it may be allergic diathesis. The natural history of IgG4RD has not been well-defined, but in patient with IgG4RD, the incidence of malignancies is higher than that in the general population [8]. Many cases were reported in Japan, where diagnostic guidelines for IgG4RKD were proposed in 2011. The proposed five conditions are 1) presence of kidney damage, as manifested by abnormal urinalysis or urine markers and/or decreased kidney function with elevated serum IgG level, hypocomplementemia, or elevated serum IgE level; 2) abnormal renal imaging findings consisting of multiple low density lesions on enhanced computed tomography, diffuse kidney enlargement, hypovascular solitary masses in the kidney, or hypertrophic lesions of the renal pelvic wall without irregularity of the renal pelvic surface; 3) serum IgG4 level exceeding 135 mg/dL; 4) renal histology showing either dense lymphoplasmacytic infiltrating IgG4-positive

plasma cells (>10 HPF) and/or an IgG4/IgG positive plasma cell ratio >40% or characteristic storiform fibrosis surrounding nests of lymphocytes and/or plasma cells; and 5) extrarenal histology showing dense lymphoplasmacytic infiltration with infiltrating IgG4-positive plasma cells >10 HPF and/or an IgG4/IgG positive plasma cell ratio < 40%. The diagnosis is classified into three stages—definite, probable, and possible—according to the combinations of the above conditions. In the diagnostic criteria, abnormal renal imaging findings are essential for making a definitive diagnosis. In the present case, to diagnosis definitively, we had collected first from a salivary gland, however, it couldn't diagnose. Kidney biopsy, therefore, was needed. All of these conditions, including imaging showing low-density lesions, pathologic examinations showing characteristic changes, and elevated serum IgG4, led to a definitive diagnosis of IgG4RKD [9]. Since IgG4RD cannot be diagnosed by any single test, we rely on a combination of histologic, clinical, radiographic, and laboratory findings [10]. To our knowledge, there are only a few case reports of IgG4RKD with both tubulointerstitial nephritis and retroperitoneal fibrosis with acute bilateral obstructive uropathy [1] [11]-[14].

4. Conclusion

We experienced a case of IgG4-related disease presenting both tubulointerstitial nephritis and retroperitoneal fibrosis causing acute renal failure. A renal biopsy should be considered to make a definitive diagnosis of IgG4RKD.

Contributions

The authors contributed equally.

Conflict of Interests

The authors declare no potential conflict of interests.

Consent

Publication of this case report has been approved by the ethics committee of Teine keijinkai hospital and consent by the patient has been obtained.

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Secondary Hypertension in Sub-Saharan African Populations: A Retrospective Study between 2011 and 2016 at Regional Hospital of Saint-Louis, Senegal

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Abstract

Introduction: High blood pressure (HBP) is a worldwide health issue responsible of high cardiovascular morbidity and mortality. Even though essential HBP is far the most frequently reported in patients, secondary causes must be known because of their severity and the possibility of aetiological treatment. No recent epidemiological data are available about secondary causes of HBP in black African populations. The aim of this study was to describe aetiological patterns of secondary HBP in patients followed at Saint-Louis Hospital. **Patients and Method:** We conducted a retrospective and descriptive study in regional hospital of Saint-Louis. All patients aged ≥15 years old admitted from January 1st 2011 to January 31st 2015 in internal medicine, nephrology, emergency and cardiology departments were included. Clinical, paraclinical data and patients outcomes were collected from medical records. Hypertension was defined according to JNC8 criteria. Secondary HBP was considered if explorations identified a clear aetiology to hypertension. Statistical analysis was done with Excel 2010 and STATA 12.0. **Results:** We included 9253 patients with mean age of 35 ± 12 years (15 - 83 years) and sex-ratio of 1.6. Overall 67.5% of patients had hypertension and secondary causes were found in 10.5% of them. The majority of patients presented clinical symptoms suggesting a secondary cause of HBP and first-line laboratory explorations were normal in half of cases. Renal diseases were responsible for 79.1% of secondary HBP cases mainly dominated by glomerulonephritis (22.6%), vascular nephropathies (18.7%) and autosomal dominant poly-

cystic kidney disease (5.8%). They were followed by preeclampsia (13.6%) and endocrinal aetiologies such as hyperthyroidism (5.8%), hypercorticism (0.5%), pheochromcytoma (0.5%), primary hyperparathyroidism (0.4%) and Conn's adenoma (0.1%). Combination of ≥3 antihypertensive drugs was necessary in 71.5% of cases and surgical treatment was performed in three patients. Blood pressure was normalized in only 27.7% of patients. **Conclusion:** Secondary causes are frequent in our young patients with HBP. In the majority of patients complete clinical examination and minimal laboratory investigations recommended by World Health Organisation can give an aetiological orientation that needs further radiological and hormonal explorations.

Keywords

Secondary High Blood Pressure, Internal Medicine, Black Africans

1. Introduction

High blood pressure (HBP) is a global public health issue associated with an important cardiovascular morbidity and mortality [1] [2]. In Africa, either in urban or in rural populations, recently reported statistics show a clear increasing burden of chronic diseases like HBP and a dramatically low level of diseases awareness and BP control [3] [4]. Essential hypertension is the most reported form but secondary causes must also be known because they are often severe but reversible under etiological treatment [4]. Data about secondary causes of HBP in black African populations are scarce and the leading curable HBP etiologies are not well identified. In this study, we aimed to describe the clinical and etiological patterns of secondary hypertension in Saint-Louis (northern Senegal).

2. Patients and Methods

We performed a prospective descriptive study including patients followed between January 1st 2011 and January 31st 2015 at regional reference hospital of Saint-Louis. All patients aged ≥18 years and with blood pressure ≥ 140/90 mm Hg were included. Clinical, biological and radiological findings were collected from medical records as well as evolution after treatment. Secondary HBP was considered in patients where explorations identified a specific cause. Hypertensive patients without etiological explorations were excluded from the study. Data were analyzed using Epi Info 7.

3. Results

A total of 9779 were admitted in internal medicine and cardiology department during the study period but 526 of them were excluded from the study because of incomplete data. Finally, 9253 patients were included in the analysis with mean age of 35 ± 12 years (15 - 83 years) and sex-ratio of 1.6. Among these 6245 presented HBP (4103 men and 2142 women) (total HBP prevalence of 67.5%). Secondary causes of HBP were found in

968 cases (prevalence of 10.5%) in contrast with 89.5% of patients suffering from essential hypertension.

Adolescents and young adults aged ≤35 years were most affected, while patients aged ≥65 years represented only 22% of secondary HBP. The majority of patients presented clinical symptoms suggesting a secondary cause of HBP and first-line laboratory explorations (WHO recommendations) were normal in half of patients (51.5%). Renal diseases were responsible for 766 cases (79.1%) of secondary HBP mainly dominated by glomerulonephritis (22.6%), vascular nephropathies (18.7%) and autosomal dominant polycystic kidney disease (5.8%). They were followed by preeclampsia (13.6%) and endocrinal aetiologies such as hyperthyroidism (5.8%), hypercorticism (0.5%), pheochromcytoma (0.5%), primary hyperparathyroidism (0.4%) and Conn's adenoma (0.1%).

Clinical examination suggested a diagnosis in 54.2% of patients with secondary HBP. Hypertension was severe (stage 2 of JNC 8 classification) in 735 patients (76%) and 212 patients (21.8%) had malignant hypertension. Visceral complications were found in patients with secondary HBP. Hypertensive retinopathy 406 cases (41.9%), acute left cardiac failure 86 cases (8.9%), malignant nephrosclerosis 186 cases (19.2%), hypertensive encephalopathy 151 cases (15.6%) and stroke 58 cases (0.6%). Electrocardiogram reported left ventricular hypertrophy in 62.5% of patients. Renal failure was found in 65.3% of patients presented electrolytes disorders such as hyponatremia (60.3% of patients), hyperkalemia (27.9% of patients) and hypokalemia (2.6%) and hyperuricemia (24.5%) Eleven percent of patients had elevated fasting blood glucose and dyslipidemia was present in 49.6% of patients.

The most commonly used antihypertensive classes were loop diuretics, dihydropyridine calcium channel blockers (CCB), Angiotensin Conversion Enzyme inhibitors (ACEI), alpha-blockers and beta-blockers. These drugs were used alone (in 28.5% of cases) or as combination therapy (in 71.5% of patients, including 48.9% of fixed-dose combination). Drugs therapy allowed an efficient control of blood pressure in only 27.9% of patients. Surgical treatment was performed in 13 patients (07 cases of hyperthyroidism, 03 cases of parathyroid adenoma, 02 cases of pheochromocytoma, 01 cases of renal vascular compression).

4. Discussion

This study shows that hypertension is a common internal medicine intake pattern and two out of five have a secondary cause. This prevalence is very high compared to those reported in the literature vary between 6 and 10.5% depending on the mode of recruitment [3] [4]. In a series of 1,020 hypertensive patients in Japan, Omura *et al.* found 9.1% of secondary causes outside the kidney [5]. Strong nephrology component of our study population was probably a selection bias involved in increase the proportion of secondary hypertension causes kidney.

The examination and clinical examination occupy a central place in the etiological research. Indeed, they already provide diagnostic guidance in the majority of cases [6]

although they can sometimes be poor [5]. In the absence of clinical signs directing them to a specific HTA etiology, to find arguments to a secondary cause are young age less than 50 years, the severity of hypertension with visceral immediately at the time of discovery [6], resistance to treatment [7] [8]. These data are also supported by the clinical and evolutionary characteristics found in our patients who are mostly young people with severe hypertension responding little treatment.

As in most series [3] [9] [10], nephropathy is also the first secondary hypertension because in our series. Followed endocrine disorders dominated by pheochromocytoma contrary to the results of Omura *et al*. who report primary aldosteronism as the most common hypertension of endocrine origin [5] [11]. Other authors report renovascular hypertension as the second most common cause of secondary hypertension [4] especially in the elderly [12].

Search endocrine etiologies, the determination of plasma renin activity and aldosterone and renal angiography sensitized the captopril test are diagnostic tests with a high sensitivity (100%) and good specificity (70% - 80%) [5] even if they have not been made in all patients. Nevertheless, the majority of them have benefited from an abdominal ultrasound, the dosage of cortisol and blood and urinary catecholamines remain with abdominal CT scan, less sensitive but very specific examinations (100%) for the diagnosis of secondary hypertension [5]. Some authors propose the plasma aldosterone/plasma renin activity is more sensitive in the detection of primary aldosteronism as well in black patients than Caucasians [9].

Undetermined etiologies were essentially made of probable chronic glomerulonephritis whose belated discovery did not allow etiological research thrust. No cause of iatrogenic hypertension was found in our series.

Despite use of drugs association in 71.5% of cases, blood pressure normalized for only 27.9% of patients. The high frequency of resistant hypertension in our patients could also be explained by the important prevalence of chronic kidney disease which is a classical cause of resistance to antihypertensive drugs [8]. Studies report a satisfactory blood pressure control in only 5.6 to 15% of patients with secondary hypertension despite the introduction of HAART [5] [8] [13].

5. Conclusion

Secondary hypertension in our series mainly concerns young people. They are happy to severe and resistant to monotherapy. Thorough clinical examination and a minimum balance WHO can often be an etiological orientation which must be confirmed by imaging studies and endocrine explorations. Etiologies are dominated by renal and endocrine causes should be sought systematically to enable early and appropriate care taken.

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Prevention Strategies of Contrast Medium Induced Nephropathy (CIN): A Review of the Current Literature

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Abstract

Contrast medium induced nephropathy is the third most common cause of renal failure for inpatients and represents the 10% of all acute kidney injury occurring during hospital-stay. It is associated with prolonged hospitalization, cost increase and, above all, an unfavourable short- and long-term prognosis. Here, the authors discuss about the contrast medium induced nephropathy prevention strategies, from the identification of patients at risk and drugs potentially nephrotoxic, to the hydration with possible administration of drugs that appeared to be, in some contexts, nephron-protective, and finally we analyze the radiological procedure aimed at the correct choice of type and administration modality of the contrast medium according to current literature.

Keywords

Contrast Medium, Acute Kidney Injury, Hydration

1. Introduction

Contrast medium Induced Nephropathy (CIN) is the third most common cause of renal failure for inpatients and represents the 10% of all Acute Kidney Injury (AKI) occurring during hospital-stay. It is associated with prolonged hospitalization, cost increase and, above all, an unfavourable short- and long-term prognosis with acceleration of chronic renal disease [1]-[3]. The imaging techniques most frequently associated with CIN are coronary angiography and Computed Tomography (CT) acquired after Contrast Medium (CM) administration. Both these exams are extensively required in

the current clinical practice [4].

Prospective studies of hospitalised patients with AKI demonstrate that CM administration is directly responsible or concurrent to renal failure development in the "11% - 14.5% of cases" [5]-[7]. Therefore, the AKI development is considered a significant complication of CM and it has been related to an increase both in morbidity and mortality despite the fact that the recent use of low osmolarity or iso-osmolar CM has significantly reduced the risk [8] [9].

2. Definition

To date, CIN is defined as an acute alteration of the renal function resulting in an increase of serous creatinine level greater than 25% compared to the basal values (pre-exam) or an absolute increase of creatinine level equal or superior to 0.5 mg/dl occurred within 48 - 72 hours following the patient exposition to CM, in absence of other possible causes of AKI [10].

CIN represents the development of renal damage that may verify after the CM administration, in absence of other identifiable causes, and it is widely recognised as one of the main causes of acquired renal insufficiency [10].

The exact pathophysiology of CIN development is still unknown but it is assumed that hypoxia, oxidative stress and free radicals produced in the renal medulla cause acute vasoconstriction, which determines renal hypo perfusion. In addition, it seems that there is direct CM toxic effect on the tubular epithelium (**Figure 1**) [11] [12].

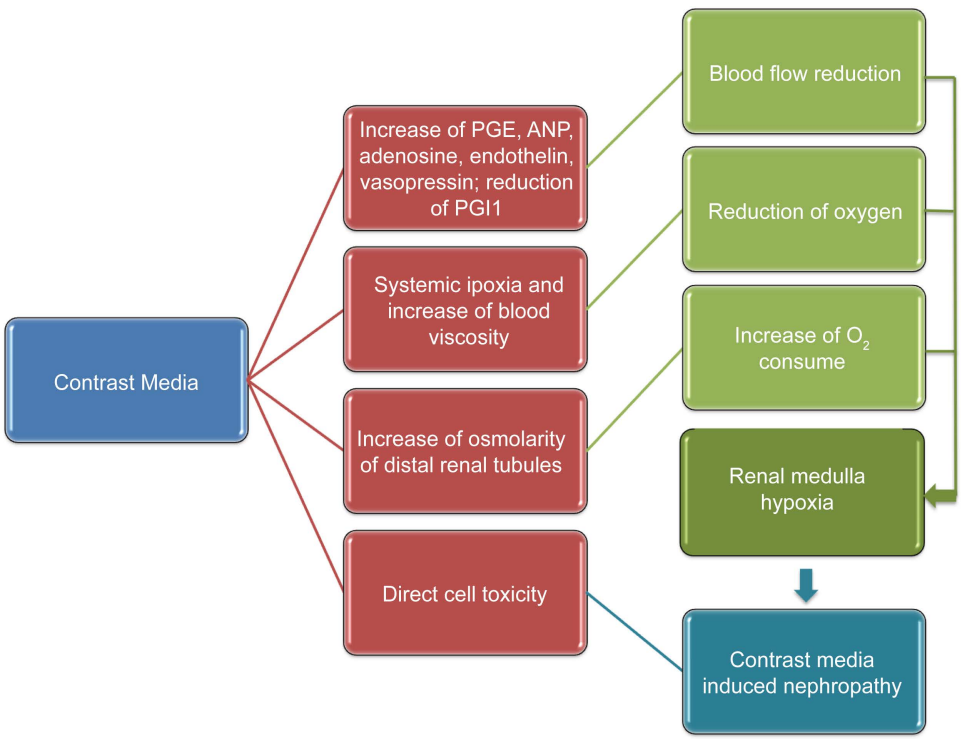

Figure 1. CIN pathogenesis.

3. Risk Factors

The development of CM nephrotoxicity has a significant impact on the duration and costs of hospitalization and on the short and long-term mortality [3]. Therefore, it is necessary to identify conditions that are thought to increase the risk of developing AKI in patients who need to be exposed to diagnostic exams and/or percutaneous procedure with CM administration.

Among predisposing conditions related to the patient, it is widely recognised the pre-existing kidney injury. There have been also associated (**Table 1**) advanced age and diabetes mellitus. In addition, numerous studies demonstrated that heart failure is a risk factor for patients undergoing percutaneous coronary intervention [13].

There are factors connected to the procedure such as type, quantity, administration modality (intra-arterial or intra-venous) of CM and interval between multiple administrations. The concurrence of these factors, associated with the population ageing, has been responsible for an increased CIN incidence, which could be avoided by adopting effective preventive measures. Before CM administration, patients should be adequately evaluated, in order to undertake the best preventive strategies to reduce CIN incidence [10].

Thus, it is important to identify the patients who might be particularly exposed [14] [15]. Fortunately, most of the patients who develop CIN have got identifiable risk factors and the results of many studies suggest that CIN onset is directly related to the number of pre-existing risk factors [16]-[18].

4. Strategies of CIN Risk Prevention

Here, we discuss about CIN prevention strategies, from the identification of patients at

Table 1. CIN risk factors.

Known risk factors	
Modifiable	**Not modifiable**
High dose of CM	Age > 65 years
Use of iodinated CM	Diabetes mellitus
High osmolarity CM	Pre-existing renal impairment
Short time interval between two injections of CM	Heart failure (NYHA III-IV)
Hypovolaemia	E.F. < 50%
Use of nephrotoxic drugs	
Presumptive risk factors	
Modifiable	**Not modifiable**
Arterial hypertension	Acquired immunodeficiency syndrome
Hypercholesterolemia	Previous kidney surgical interventions
Hyperlipidemia	Vasculitis
Hypoalbuminemia	Race

risk and drugs potentially nephrotoxic, to the hydration with possible administration of drugs that appeared to be, in some contexts, nephroprotective, and finally we analyse the radiological procedure aimed at the correct choice of type and administration modality of the CM.

4.1. Identification of Patients at Risk

Strategies to reduce CIN incidence first suggest identifying patients at risk and finding for them, when possible, alternative examination tools. They can be identified through the use of questionnaires, the collection of complete anamnesis and the evaluation of glycaemia and, most of all, the assessment of renal function before the CM administration [10].

The glomerular filtration rate (GFR) through either MDRD or Cockroft-Gault formulas correlates with the renal function better than the serous creatinine [19]-[21].

The GFR estimate should be obtained within 3 months before a radiological exam with CM in stable day hospital patients, and within 7 days in the hospitalized ones. The measurement should be the latest possible in patients likely to be affected by a recent modification of the renal function (haemodynamically unstable patients, recent chemotherapy, recent use of nephrotoxic drugs, etc.) [21].

When it is not possible to obtain GFR in due time, for example in Emergency room, the presence of multiple risk factors might indicate patients susceptible of glomerular filtration reduction and therefore renal damage induced by CM [21].

Patients with a GFR ≥ 60 ml/min have an extremely low CIN risk and, generally, do not require preventive measures or follow-up. Using preventive measures when the GFR is <60 ml/min is considered worthwhile. In particular, several studies suggest that GFR cut-off for CIN risk is 40 - 45 ml/min and efforts to reduce the CIN risk should be concentrated on patients with GFR < 45 ml/min, with a specific attention to patients with a serious renal dysfunction (GFR < 30 ml/min) and additional risk factors [22] [23].

4.2. Potentially Nephrotoxic Drugs When Associated with CM

Drugs that may exacerbate CIN can be divided into three categories:

1) FANS, aminoglycosides, cyclosporine, tacrolimus and amphotericin, which act with a direct nephrotoxic mechanism and which is better to suspend at least 24 hours before CM administration [24].

2) Some antihypertensive drugs, among which ACE-inhibitors, angiotensin II receptor antagonists and aliskiren interfere with the renin-angiotensin system and decrease the renal perfusion, particularly when it is based on the renin-angiotensin system (in case of hypovolemia, dehydration, heart failure or renal artery stenosis). It has been recently demonstrated that these drugs represent a risk factor for CIN in patients undergoing coronarography [25]. Nevertheless, there is no evidence that the suspension of these drugs is useful for preventing CIN; hence, to date, it is not recommended their routine interruption [21].

3) Metformin, which itself do not increase the CIN risk, may generate lactic acidosis in case of worsening of renal function and it is cause of acute cell damage. For this reason, it is recommended metformin interruption 48 hours before the CM administration in case of pre-existing renal failure (GFR < 60 ml/min) and restart 48 hours later, after evaluation of renal function [26]. The European Society of Urogenital Radiology (ESUR) adopts a conservative approach and recommends to continue the therapy with metformin until the CM injection in patients with normal serous creatinine levels and to suspend it 48 hours before the injection in patients with a compromised renal function [21].

4.3. Detraction or Dose Reduction of Iodinated CM

Obviously, the risk of CIN onset might be completely avoided obtaining necessary diagnostic data without intravascular administration of iodinated CM [26]. However, in some cases the use of CM is essential but it could be used an inferior dose as the renal toxicity of the iodinated CM is dose-dependent [27].

The CIN prevalence is connected with the CM volume administered, and it has been observed that the lowest rates of CIN risk affect patients receiving less than 100-140 ml of CM. CM administered in volumes higher than 5 ml/Kg is strongly predictive of a serious acute renal insufficiency, which needs a dialysis treatment [28]. Recent studies found that by using only 50% of normal dose of CM it is possible to acquire appropriate diagnostic images of peripheral arteries, but reducing CIN development in patients at risk [29].

Moreover, Leheti *et al*. showed how complications after endovascular aneurism repair appear to be acceptably imaged using only half dose of CM in patients with weight < 90 Kg or BMI < 35 Kg/m^2 [30]. It has been also demonstrated a significant increase of the CIN risk among patients who received a second CM dose within 48 hours after the administration of the first [31]-[33].

It should be reduced the CM volume to the bare minimum, avoiding repeated injections by 72 hours. Moreover, it should be used the minimum amount of iodinated CM which allows satisfying image quality, as it could be often diluted with physiological solution without compromising the image quality [33].

4.4. Choice of Low-Osmolar Contrast Medium

One of the advantages of the use of low-osmolar instead of high-osmolar CM is the reduction of CIN incidence in patients at risk [34]. The mechanisms that determine the CIN risk reduction with low-osmolar CM have not been clarified yet. Possible explanations concern the reduced osmolarity itself, the different ionization, and/or other chemical-physical properties [35]. High-osmolar CM are related to more systemic adverse events, including CIN, than low- or iso-osmolar CM. Therefore, the use of CM with higher osmolarity should be avoided in patients with chronic renal insufficiency. In particular, iso-osmolar CM has been demonstrated to be related to low nephrotoxicity, therefore, it has been widely recommended for patients with renal failure [36].

4.5. Hydration

Hydration is the only accepted prophylactic strategy for CIN and it is strongly recommended by the Guidelines, as it is effective in reducing the risk and severity of the nephropathy [37]-[39]. All the patients considered at CIN risk should receive hydration. The crystalloids generally used are saline isotonic solution and bicarbonate (154 sodium bicarbonate mmol per 0.85 liter of dextrose at 5%), which are low-cost and harmless for the patients. The possible physiopathological explanation about the hydration efficacy in reducing the CIN risk could be related to the fact that, if correctly completed, it increases the intravascular volume and induces diuresis. Consequently, there is CM dilution in the renal tubules resulting in reduction of its contact time with the tubular epithelium inside the kidney. Moreover, diuresis increase leads to vasodilatation at the level of renal medulla, which is a region more vulnerable to the CM action, probably increasing the prostacyclin production. Furthermore, the volume expansion suppresses the renin-angiotensin system and the anti-diuretic hormone (ADH) production with a vasoconstrictor effect [21]. Particularly for patients with left ventricular dysfunction is important to improve renal blood flow to prevent CIN, as recently demonstrated by Kawatani *et al.* in a group of patients undergoing endovascular stent graft positioning [40]. Both intravenous and oral hydration have been proposed, however, to the best of our knowledge, there are not strong evidences to consider the oral administration as effective as the intravenous infusion in patients at CIN risk [35] [41]. The most widespread intravenous hydration regime are: 2 ml/Kg/h 2 hours before CM administration and 1 ml/Kg in the following 6 hours; or 1 ml/Kg/h 12 hours before and 12 hours after the procedure [42].

4.6. Premedication

Pharmacological prophylaxis for preventing CIN would represent the best result to achieve, however, no medication offers a certain efficacy. In particular, several studies showed the possible role of N-Acetylcysteine (NAC) to prevent CIN due to its double role as vasodilator and antioxidant or because its effect on urine alkalinisation [43]-[46]. Numerous protocols have been proposed for NAC use. Actually, CIN incidence has been significantly reduced with oral administration of 600 mg of NAC 24 hours before CM injection instead of hydration alone [47]. Another study proposed intravenous NAC 7 hours instead of 20 min before CM injection to prevent CIN after coronarography [45]. In a randomized study, Li *et al.* compared pre-medication with probucol and hydration. They demonstrated that oral intake of 500 mg of probucol twice a day for 3 days before and after coronary intervention procedure was associated with lower serum creatinine levels than the hydration group [48]. Another study showed that administration of 3 g of ascorbic acid before and 2 g after the procedure markedly reduced the CIN incidence [49]. However, high doses of NAC seem to be more effective than ascorbic acid [50]. Lee *et al.* attested that a short pre-treatment of 2 mmol/L of NAC for 15 min before CM injection and a supplementary dose of NAC 12 hours after reduced CIN more than pre-treatment with probucol or ascorbic acid [51]. Neverthe-

less, data about the efficacy of NAC and other drugs in reducing the incidence of CIN are divergent, therefore, usefulness remain unproven and their use cannot be recommended [52] [53].

4.7. Haemodialysis and Hemofiltration

The sense of haemodialysis in patients at high risk for CIN is the early removal of the CM from the blood [54]. Several studies have been published in order to determine if haemodialysis post-administration of CM reduces CIN rate [55]-[57]. A systematic literature review has highlighted that haemodialysis, even if performed after CM administration, is not effective in reducing CIN rate, probably due to the very early CIN development after CM administration [55]. Moreover, haemodialysis simultaneous with CM administration has not been effective in reducing the damage. In addition, haemodialysis is related to risks connected to the procedure itself, and it can be in some cases nephrotoxic because of phlogosis activation and volume depletion [56].

The hemofiltration is a continuous form of renal replacement therapy. When solutes and water are removed from blood, fluids are substituted by big volumes of isotonic fluid, which help maintaining the hemodynamic stability [58]. With this procedure, most of the CM is removed from blood with the hemofiltration while the isotonic fluid dilutes the remaining CM [59].

The hemofiltration is an expensive procedure, which is performed in intensive care. Even though it may be effective for highly selected patients at extremely high risk of CIN, evidence of its efficacy remains poor [60].

5. Conclusions

To date, CIN is one of the most serious adverse reactions to iodinated CM. Since there is no specific therapy for CIN and the disease is iatrogenic, prevention is of paramount importance [45]. The patients at highest risk have a GFR below 60 ml/min. GFR measurement is particularly recommended before intravascular administration of iodinated CM in patients affected by renal disease, positive familiar anamnesis, renal insufficiency, diabetes under medical therapy, vascular collagen diseases, previous renal surgery or which are under treatment with metformin or nephrotoxic drugs like aminoglycosides and nonsteroidal anti-inflammatory [61] [62]. All patients should be persuaded to freely drink water 12 hours before and after CM injection, when possible. Intravenous hydration, which expands the blood volume, is the only intervention to limit hypoxic damage and direct toxic effect of CM and to prevent CIN. The hydration protocols consider 1 - 1.5 ml/kg/h intravenous saline isotonic solution administration 6 - 12 hours before the CM administration and for 6 - 24 hours after. For hospitalized patients, it should be applied a 24-hour protocol which includes 1 ml/Kg/h of saline solution administration, beginning 12 hours before and continuing for 12 hours after CM injection [63].

No pharmacological prophylaxis (with vasodilators that have a renal action, receptor antagonists of endogenous vasoactive mediators, cytoprotective drugs) has been

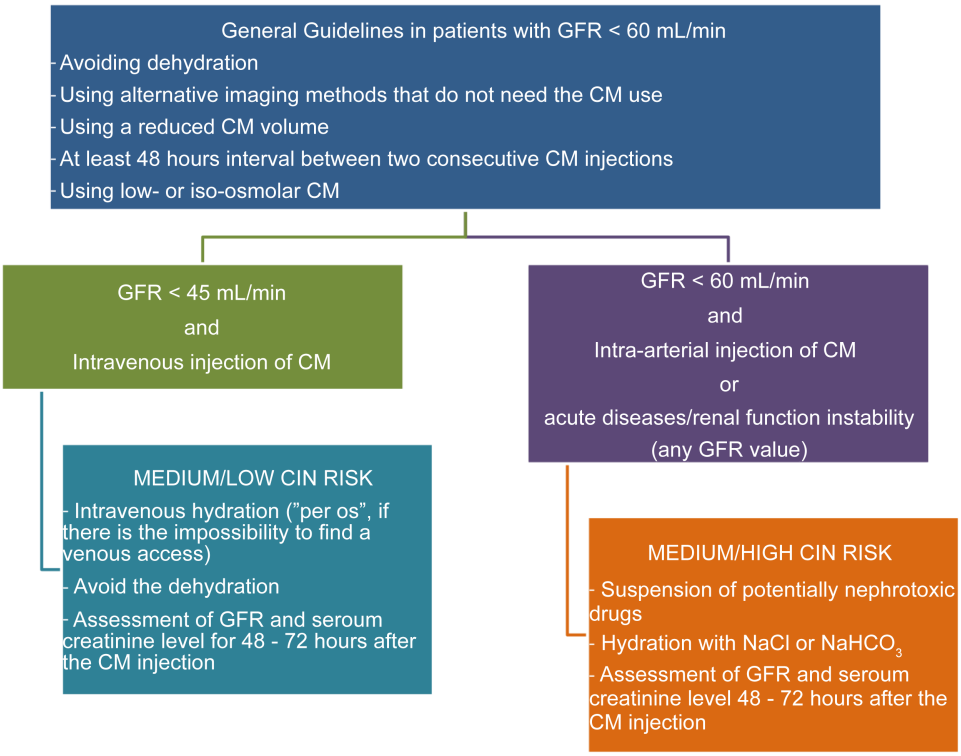

Figure 2. Guidelines for patients with GFR < 60 ml/min modified from Owen RJ *et al.* [64].

demonstrated to be useful in preventing the nephropathy caused by CM. The hydration pre- and post-CM administration represents the only prevention therapy strongly recommended by the guidelines for patients at risk (**Figure 2**) [10] [21] [64].

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Conflict of Interest

The authors declare that they have no conflict of interest.

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Abbreviation Note List

CIN: Contrast medium Induced Nephropathy

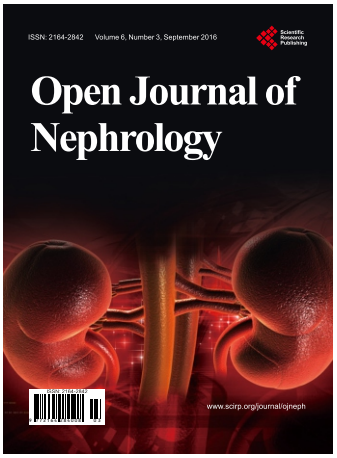
AKI: Acute Kidney Injury

CM: Contrast Medium

GFR: Glomerular Filtration Rate

ADH: Anti-Diuretic Hormone

NAC: N-AcetylCysteine



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