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Underlying Primary Causes of Chronic Renal Failure: A Three-Year Study in Al-Thawra General Hospital, Sana'a, Yemen

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ABSTRACT

Objective: To estimate the underlying primary diseases of chronic renal failure (CRF) among patients attending Al-Thawra General Hospital, Sana'a, and Yemen.

Methods*:* This was a cross-sectional, hospital-based study of 566 patients diagnosed with chronic kidney diseases (CKD). It studied the cases attending Al-Thawra General Hospital over a three-year period from January 2013 to December 2015.

Results: Out of 566 patients, 339 (59.9%) were males. The mean age of the patients at diagnosis of CKD was 39.51 years, most of whom (36.6%) were of the age group of 21–35 years. Hypertension was the most frequent cause (43.2%) of CRF, followed by different infectious diseases such as malaria, schistosomiasis and bacterial infections (19%) and obstructive nephropathy (17.9%). On the other hand, CRF of unknown etiology represented 15.2% of cases. Other causes of CRF diabetic nephropathy (9.7%), effect of antibiotics and analgesics (7.0%), ischemic heart disease (4.8%, polycystic kidney disease (3.5%) and congenital anomalies (3.4%). The least common causes were autoimmune diseases, bleeding, traumatic accidents and chronic diarrhea, being responsible for 2.2%, 1.8%, 0.9% and 0.4% of CRF cases, respectively.

Conclusions: The majority of CKD cases in our study were males aged between 21 and 35 years old. In addition, most cases of CKD are due to hypertension, followed by infections and obstructive nephropathy. Application of future prevention and control measures are highly recommended to reduce the burden of CRF in Yemen for early detection and proper management of its underlying primary conditions/diseases.

Keywords: Chronic renal failure, Primary disease, Sana'a, Yemen

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1. Introduction

Chronic kidney disease (CKD) is a major public health problem worldwide, including Yemen (1–2). Early referral of such diseases can help to preserve renal function and delay the progression of renal failure by managing their modifiable risk factors and treating secondary complications (3–6). CKD is defined according to the presence or absence of kidney damage and level of kidney function—regardless of the type of kidney disease (7). Its detection is based on simple biochemical tests such as a creatinine-based glomerular filtration rate (8), and it is categorized into five stages of increasing severity (9). The frequency of cardiovascular disease (CVD), hypertension, diabetes and obesity is increasing throughout the world and is commonly associated with an increase in the prevalence of CKD (10–13). The increasing number of patients requiring dialysis and kidney replacement therapy in Yemen poses challenges to health professionals and to the healthcare system.

Of 22 governorates in Yemen, Sana'a city is the capital and the most populated. A study on the end-stage renal disease (ESRD) in Sana'a (population 1,200,000) reported an incidence of 385 cases per million population/year (14). Moreover, the incidence of the ESRD is probably higher in the coastal city of Hodeidah due to the high prevalence of schistosomiasis and renal stones. In the southern part of Yemen, about 200 new cases per year are recorded in Aden (14). Development of CKD prevention and control strategies is a key factor for reducing the burden of the disease. In addition, exploring risk factors and at-risk populations are of paramount importance for developing suitable interventions in different populations (15). Therefore, the aim of the present study was to estimate the underlying primary conditions of CRF in Al-Thawra General Hospital (AGH), Sana'a, Yemen.

2. Methods

2.1. Study design, ethical clearance and data collection

This was a cross-sectional, hospital-based study carried out over a period of three years, from January 2013 to December 2015. The study protocol was approved by the Ethics Committee of the AGH and the Ethics Committee of the Faculty of Medicine and Health Sciences, University of Science and Technology. In addition, informed consent was obtained from study participants before data collection. It included 566 patients with CRF followed in the Nephrology Clinic and Dialysis Unit of the Urology and Nephrology Center, AGH. All patients in the present study fulfilled the revised National Kidney Foundation criteria for the diagnosis of CKD (1), excluding non-Yemenis and those with other life-threatening diseases. The AGH is the largest public hospital in Yemen, which has the main dialysis center that receives patients from all around the country. Data about age and sex were collected using a data collection sheet. Clinical information on the underlying causes of CKD was obtained from patients' files.

2.2. Statistical analysis

The statistical analyses of the data were performed by using SPSS Version 21.0 software. Patients' characteristics and the underlying primary causes of CKD were expressed as frequencies and percentages.

3. Results

Of 566 patients with CKD, 339 (59.9%) were males and 227 (40.1%) were females. The mean age of the patients was 39.51 years (range: 6–

80), most of whom (36.6%) were in the age group of 21–35 years (Table 1). The underlying causes of CRF are summarized in Table (2). Among patients with CRF, hypertension (43.2%) was the most common cause, followed by infection (19.0%) and obstructive nephropathy (17.9%) while CRF of unknown etiology represented 15.2% of cases. Other causes of CRF included diabetic nephropathy (9.7%), effect of antibiotics and analgesics (7.0%), ischemic heart disease (4.8%), polycystic kidney disease (3.5%) and congenital anomalies (3.4%). However, the least common causes of CRF were autoimmune diseases, bleeding, traumatic accidents and chronic diarrhea, being responsible for 2.2%, 1.8%, 0.9% and 0.4% of cases, respectively.

Table 1. Distribution of chronic renal failure patients admitted to Al-Thawra General Hospital in Sana'a by their sex and age group (2013–2015)

Age (years)	Sex		Total
	Male n (%)	Female n (%)	n (%)
<20	29 (5.1)	27 (4.8)	56 (9.9)
21–35	130 (23.0)	77 (13.6)	207 (36.6)
36–50	89 (15.8)	76 (13.4)	165 (29.2)
51–65	72 (12.7)	43 (7.6)	115 (20.3)
66–80	19 (3.4)	4 (0.7)	23 (4.1)
Total	339 (59.9)	227 (40.1)	566 (100.0)

4. Discussion

CKD, also known as chronic renal disease, is a progressive kidney function loss that develops over months or years. In the present study, patients with CRF are predominantly males and are younger than those reported from other parts of the world (3–6, 10–13). The prevalence of hypertension as a cause of CRF in our study is higher than that reported from the developed countries, where hypertension as a cause of ESRF ranges from 24.5 to 30% (16). However, it is consistent with the rates previously reported from different areas and hospitals in Yemen,

Table 2. Underlying causes of chronic renal failure among Yemeni patients admitted to Al-Thawra General Hospital in Sana'a (2013–2015)

Underlying cause	Chronic renal failure n (%)		
	Male	Female	Total
Hypertension	142 (25.1)	102 (18.1)	244 (43.2)
Infections			
Malaria	21 (3.7)	7 (1.2)	28 (4.9)
Chronic pyelonephritis	14 (2.4)	11 (2.0)	25 (4.4)
Schistosomiasis	17 (3.0)	3 (0.5)	20 (3.5)
Hepatitis B	16 (2.8)	6 (1.1)	22 (3.9)
Hepatitis C	8 (1.3)	5 (1.0)	12 (2.3)
Total	68 (13.2)	40 (5.8)	148 (26.1)
Obstructive nephropathy			
Stones	61 (10.8)	20 (3.5)	81 (14.3)
Prostatic enlargement	1 (0.2)	0 (0.0)	1 (0.2)
Neurogenic bladder	1 (0.2)	0 (0.0)	1 (0.2)
Other causes of obstruction	12 (2.1)	6 (1.1)	18 (3.2)
Total	75 (13.3)	26 (4.6)	101 (17.9)
Unknown cause	43 (7.6)	43 (7.6)	86 (15.2)
Diabetes	34 (6.0)	21 (3.7)	55 (9.7)
Drug toxicity			
Antibiotics	5 (1.0)	7 (1.2)	12 (2.2)
Analgesics	16 (2.8)	11 (2.0)	27 (4.8)
Total	21 (3.8)	18 (3.2)	39 (7.0)
Ischemic heart disease	18 (3.3)	9 (1.5)	27 (4.8)
Polycystic kidney	11 (2.0)	9 (1.5)	20 (3.5)
Congenital anomalies	12 (2.1)	7 (1.2)	19 (3.4)
Autoimmune diseases			
Systemic lupus erythematosus	2 (0.4)	4 (0.7)	6 (1.1)
Vasculitis	1 (0.2)	0 (0.0)	1 (0.2)
Post-streptococcal	2 (0.4)	3 (0.5)	5 (0.9)
Total	5 (1.0)	7 (1.2)	12 (2.2)
Bleeding	3 (0.5)	7 (1.2)	10 (1.8)
Traumatic accident	3 (0.5)	2 (0.4)	5 (0.9)
Chronic diarrhea	2 (0.4)	0 (0.0)	2 (0.4)

where hypertension was the most common cause of CRF (17–20). It is noteworthy that hypertension is also an important risk factor for CVDs and can influence their high incidence among CKD patients (10–13).

Infections, including malaria, chronic pyelonephritis, hepatitis B and C and schistosomiasis, were the second most common cause of CRF among Yemeni patients. This is in contrast to the developed countries, where infections are the least common causes of CRF (21); however, it is consistent with findings reported from Jordan, Egypt, North Africa, Pakistan and India, where

infections such as glomerulonephritis are common causes of CRF (22–27). On the other hand, Obstructive nephropathy was the third most common primary cause (17.9%) of CRF among Yemeni patients, which is mainly caused by urolithiasis. Similarly, previous studies reported that obstructive neuropathy was reported to cause 13.5–17.1% of CRF among Yemeni patients (17–20). However, a slightly lower rate of 11.0% of CRF secondary to obstructive neuropathy was reported from Egypt (26).

The low rate of less than 10% of CRF secondary to diabetes in the present study is lower than those reported from neighboring countries, where higher rates of CRF (17.0–43.0%) were attributed to diabetes (5, 22, 28, 29,30). Diabetes is also an important risk factor for CVDs, influencing their high incidence among CKD patients (10–13). Furthermore, 15.2% of CRF among Yemeni patients in the present study was attributed to unknown etiology. This is much lower than that reported in previous studies from Yemen, where unknown etiology accounted for 57.0% of CRF (19, 20). Such a relatively high rate of CRF of unknown etiology might be attributed to delayed medical counseling until failure already happened or to the shortage of diagnostic tools. In addition, the rate of CRF of unknown etiology in the present study is lower than those reported from Egypt and Turkey, being 27.0 and 26.7%, respectively (31, 32).

Polycystic kidney disease was the most common congenital disease causing CRF, being responsible for 3.5% of cases in the present study, whereas other congenital diseases collectively represented 3.4% of the causes. In previous studies in Yemen, polycystic kidney disease accounted for 6.6 and 2.5% of CRF causes in Sana'a city and Hajjah governorate, respectively (17, 19, 20). The finding of the present study is inconsistent with that reported from Turkey, where congenital diseases caused 8.9% of CRF (32). In the present era, drugs have emerged as important causes of renal injury and CRF. In this context, antibiotics and analgesics accounted for 4.8 and 2.2% of CRF among Yemeni patients, respectively. However, a slightly higher rate of 6.0% was reported from Egypt (31). The rate of other causes of CRF in the present study is similar to those reported elsewhere from both the developed and developing countries (16, 21, 32), where ischemic heart disease and autoimmune diseases, mainly systemic lupus erythematosus were responsible for 4.8 and 1.1% of cases, respectively. The least common causes of CRF in the present study were associated with bleeding (1.8%), accidental trauma (0.9%) and chronic diarrhea (0.4%). This finding is similar to those reported elsewhere (16, 21, 33).

5. Conclusions

CRF is a major public health problem in Yemen that has great socioeconomic and medical consequences. The majority of CKD cases in our study were males, aged between 21 and 35 years old. In addition, most cases of CKD are due to hypertension, followed by infections and obstructive nephropathy. The incidence of CKD is expected to increase in Yemen as the population ages and the prevalence of infections, diabetes and hypertension rises; however, many people are unaware they have reduced kidney function. Earlier identification of CKD accompanied by aggressive treatment consisting of well-known therapies holds the potential to slow progression to kidney failure and prevent development of sequelae, including CVDs and premature death. Consideration of the co-morbid conditions associated with CKD, including hypertension, diabetes, infections, CVDs, and anemia, is essential for optimal patient management and slowing of CKD progression as well as for careful

use of healthcare cost. Improving the management of patients with CKD requires education and action by all facets of the healthcare system, including patients, physicians and researchers.

Authors' contributions

MYN, HAA and ASA designed the study; MYN, HAA and HAM contributed to patient meeting, data collection and analysis; MYN, HAA, NWA and IHE contributed to data analysis and interpretation of results. HAA and ASA drafted the manuscript. MYN, HAA, ASA and HAM revised the manuscript. All authors read and approved the final manuscript.

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Competing interests

The authors declare that they have no competing interests associated with this article.

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