IJKD KIDNEY DISEASES

Chronic Kidney Disease Management Program in Shahreza, Iran

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Keywords. chronic kidney disease, screening, primary health care

Original Paper

Introduction. Chronic kidney disease (CKD) is a public health problem that needs an integrated program to be detected, monitored, and controlled. This study reports the results of a CKD program designed and implemented in Shahreza, Iran.
Materials and Methods. After initial evaluation of CKD in Shahreza, a CKD management program was developed in the Ministry of Health and the pilot project was started in February 2011 in Shahreza rural areas. The patients at risk, including those with diabetes mellitus and hypertension, were tested with serum creatinine and urine albumin-creatinine ratio. The CKD management program included training, screening, monitoring, and controlling of weight, hypertension, diabetes mellitus, lipids, and vitamin D.
Results. This pilot program was organized in the rural population aged over 30 years who were suffering from hypertension, diabetes mellitus, or both, and resulted in the discovery of cases in various stages of CKD. The prevalence of CKD in this high-risk group was 21.5%. Persistent albuminuria and a glomerular filtration rate less than 60 mL/min/1.73 m^2 were 13% and 11%, respectively. The rate of CKD stages 1, 2, 3a, 3b, 4, and 5 were 2.75%, 6.82%, 10.08%, 0.92%, 0.31%, and 0.17% respectively. After 1 year of the program implemented, incidence rate of CKD was 24% and improvement rate was 21%. In diabetic patients, the mean of hemoglobin A1c decreased from 8.5 ± 1.9% to 7.5% ± 1.8%.
Conclusions. Integration of CKD programs in primary health care is possible and results in improvement in management of CKD patients.

IJKD 2014;8:450-6
www.ijkd.org

INTRODUCTION

Chronic kidney disease (CKD) is a public health problem and the increasing prevalence is associated with increased costs and poor results. Kidney disease is delineated as an abnormality of kidney structure or function with effects on the health, which can occur sharply, and either improve or grow into a chronic condition. Chronic kidney disease is a general term for various disorders. The concept of CKD developed after the acknowledgment of the contribution of disordered kidney structure and function on the health of individuals across a widespread range of severity. The utility of the concept is that detection of CKD will have indications for the individual and their care. Earlier stages of kidney disease are often asymptomatic, are detected during the assessment of comorbid conditions, and may be recoverable. A temporary albumin-creatinine ratio (ACR) greater than 30 mg/g can happen in disorders other than CKD.

Reduction of albuminuria within 3 months is in association with recovery from these disorders and it is not defined as CKD. Patients with persistent albuminuria would be reflected to have CKD.[1] Extensive efforts for prevention, early identification, assessment, and treatment of CKD can prevent complications of decreased kidney function and reduce progression of CKD to end-stage and complications of cardiovascular disease. Due to the increasing prevalence of CKD around the world, the emphasis is on preventive care. The prevalence of CKD increases considerably with age, obesity, diabetes mellitus (DM), and hypertension.

Physicians treat chronic patients in a larger scale such as family, community, and society. There is little public awareness about the risk of kidney disease. Most patients in early stages of kidney disease are not aware of CKD. In one study, less than half of patients with CKD stage 4 were aware of their disease and 3% to 8% of patients were aware of the later stages.[2] If screening for kidney disease leads to the identification of proteinuria, the progression of kidney failure and proteinuria can be slowed down by using Angiotensin-converting enzyme inhibitors and angiotensin receptor blockers. Intervention actions are required in primary, secondary, and tertiary prevention of CKD. Screening is necessary to be performed at the public level, beginning with the urine test, and then glomerular filtration rate (GFR) should be estimated.[3] The treatment and care of patients with CKD require a large part of the treatment resources. Preventive care is important because of the increasing prevalence of CKD around the world.

In the years 2002 to 2005, Safarinejad[4] investigated a population of 17 240 people over 14 years in 30 regions in Iran. Urine protein, serum creatinine, and blood glucose were measured and the GFR was calculated. The rate of CKD stages 1 to 5 were 2.2%, 2.1%, 7.8%, 0.3%, and 0.2%, respectively. The most common causes of ESRD in Iran were DM and hypertension in 2004.[5] The high-risk target population for CKD in Iran can be those with DM, hypertension, hyperlipidemia, advanced age, and obesity (possibly abdominal obesity).[6]

In Shahreza, a city in Isfahan province of Iran, a GFR less than 60 mL/min/1.73 m^2 was found in 4.7% of the population and albuminuria (ACR $\geq$ 30 mg/g) was present in 16.2% of the participants.[7] In a study on 200 diabetic patients in Iran, 16.2% had albuminuria.[8] In Kallaleh CKD Study,[9] the prevalence of a GFR less than 60 mL/min/1.73 m^2 was 4.6%. The prevalence and incidence rate of advanced kidney failure were 238 and 49.9 per million population in 2000 to 2008, respectively, increasing to 63.8 per million population. Forty-four percent of end-stage renal disease (ESRD) cases in populations over 60 years and 63% of the ESRD population are over 50 years (2005).[10] The current annual rate of ESRD in Iran is about 12.6%, and the growth rate has been reduced, and it can even remain stable if the intervention occurs.[11] The prevalence of hypertension, DM, and obesity according to STEPs 2006 in Iran were 17.3%, 9.7%, and 16.7% respectively.[12] The total burden of CKD in 2004 was assessed to be over 1 145 600 years in Iran. The total disability-adjusted life years per 1000 population was reported to be 17 years.[13]

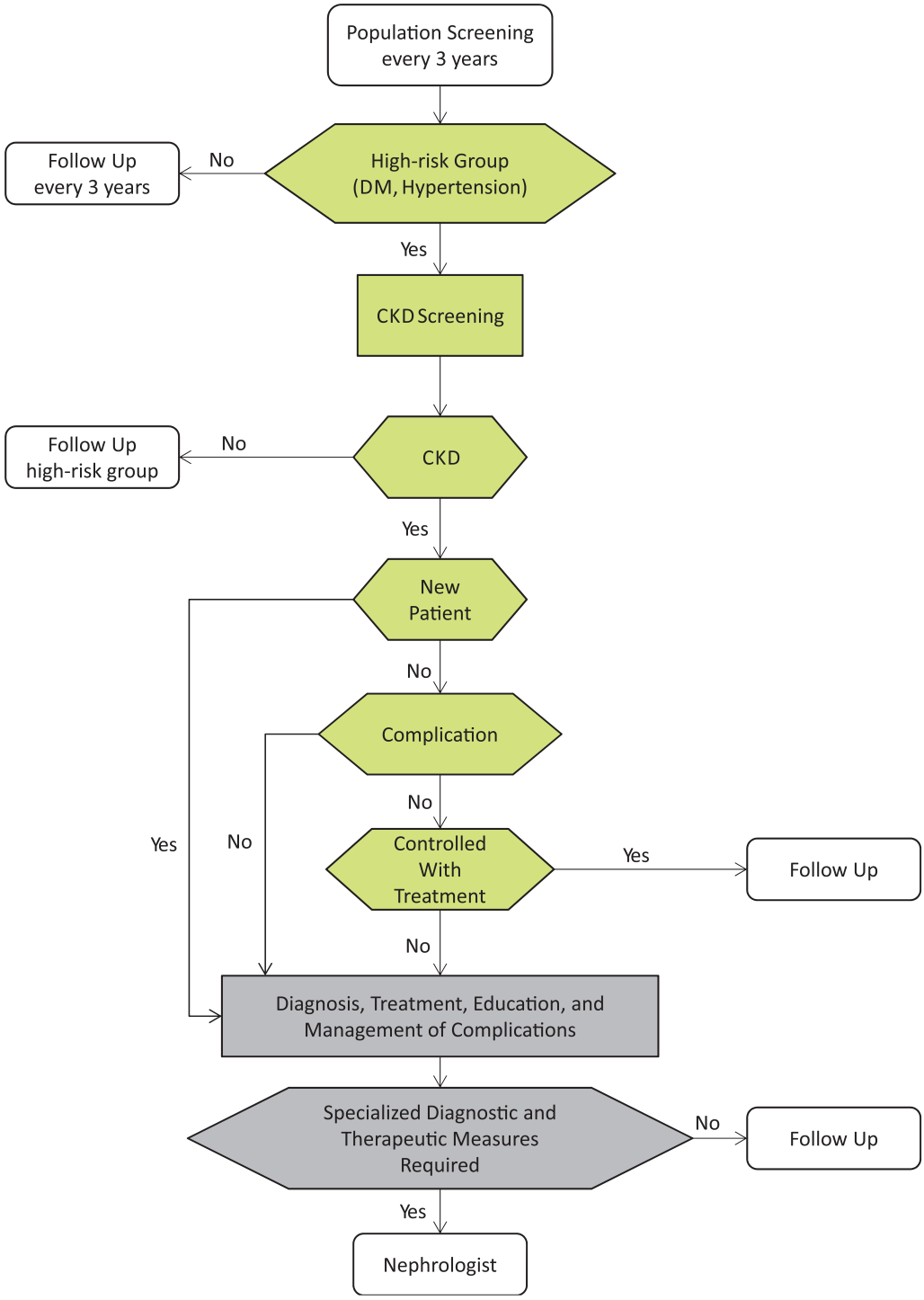
After an initial evaluation of CKD in Shahreza, CKD management program was developed in the Ministry of Health, and a pilot CKD management project was started in February 2011 in this city. This study reports the methodology and results of this CKD management program.

MATERIALS AND METHODS

Screening, Prevention, and Management

After the approval of the pilot project, training workshops were formed for internists and local executive authorities in January 2011 for two days in the Department of Transplant and Specific Diseases. In February 2011, the program was started as a pilot in 4 towns. In accordance with the guidelines, holding orientation sessions for different levels were implemented by the executive authorities in all pilot areas. The team in charge at the Headquarters Department of Health attended and monitored the program based on the checklists. The province universal teams monthly visited the piloted towns and reflected their feedback to the Ministry headquarters. Healthcare Networks of cities visits of levels one and two weekly and monitoring program were done in accordance with existing checklists.

The program algorithm is shown in the Figure. After identifying the risk factors in the national screening program, patients with hypertension and DM were referred to the family doctor as those at risk of CKD. Individuals at risk were



Algorithm of management of chronic kidney disease (CKD) in primary health care.

also referred to the laboratory to be screened for CKD. The patients were tested for serum creatinine and urinalysis. Proteinuria was detected by dipstick urine strips. Also, ACR was calculated by nephelometric turbidity measurement of albumin in Shahreza. Patients who were identified with DM and hypertension for the first time or had complications or were not controlled with medications and had a progressive course were referred to the second level of CKD management.[14] Patients were treated in specialized clinics by internists or nephrologists, nurses, and dietitians, and the type of diet, physical

activity, and medication regimens were planned. If the risk of chronic complications was present, the internists would examine the patient and determine the treatment protocol.

Diagnosis Criteria and Classification

Chronic kidney disease was diagnosed with a GFR less than 60 mL/min/1.73 m^2 for more than 3 months or an ACR of 30 mg/g and greater for more than 3 months. Six stages of CKD were defined according to glomerular filtration: stage 1, a GFR equal to or greater than 90 mL/min/1.73 m^2 and protein in the urine; stage 2, a GFR of 60 mL/min/1.73 m^2 to 89 mL/min/1.73 m^2 and protein in the urine; stage 3a, a GFR of 45 mL/min/1.73 m^2 to 59 mL/min/1.73 m^2; stage 3b, a GFR of 30 mL/min/1.73 m^2 to 44 mL/min/1.73 m^2; stage 4, a GFR of 29 mL/min/1.73 m^2 to 15 mL/min/1.73 m^2; and stage 5, a GFR less than 15 mL/min/1.73 m^2. The CKD-EPI equation was used for estimating GFR.[15,16]

RESULTS

As shown in Tables 1 and 2, this pilot program was organized in rural populations of over 30 years of age in Shahreza who were suffering from hypertension, DM or both, and resulted in the discovery of cases in various stages of CKD. During the program, patients with DM and hypertension participated in the first step. The second step was done in 80% of patients with abnormal testing. The number of CKD stages 1 and 2 discovered was 94 and 108 patients had CKD stage 3. At this step, the GFR reduction and complications of CKD were identified and appropriate treatment for it was considered to reduce or delay in reaching the next stage. Three patients were reported to have CKD stage 4. The overall prevalence of CKD in the high-risk group in Shahreza was 21.5%. In this study, 85% of CKD patients were older than 60 years. Persistent albuminuria and a GFR less than 60 mL/min/1.73 m^2 were prevalent in 13% and 11%, respectively. At these stages, protecting and preserving the remaining kidney function of the patient to prevent or delay the development of advanced kidney failure and treatment of complications of CKD and social preparation, psychological, and physical therapy and alternative methods are desirable. The rate of CKD stages 1, 2, 3a, 3b, 4, and 5 were 2.75%, 6.82%, 10.08%, 0.92%, 0.31%, and 0.17%, respectively. After 1 year of program implemented, 345 participants in the program accepted to undergo screening again. These patients were 220 and 124, respectively, without and with CKD in the initial evaluation; 69 and 27 participants, respectively, were new cases and already treated cases of CKD. Incidence rate of CKD was 24% and improvement rate was 21%.

Hemoglobin A1c decreased in diabetic patients, from 8.50 ± 1.9% to 7.50 ± 1.85%, after implementation of the CKD program (P = .002). Increasing GFR, decreasing albuminuria, and decreasing low-density lipoprotein cholesterol levels were significant (P = .001, P = .001, and P = .02, respectively). The ACR and GFR were measured at 3 time points. The repeated measures analysis of variance was used to investigate changes and comparison between the two groups of CKD and no CKD over time. Descriptive results are summarized in Table 3. According to the results in

Table 1. Results of Sampling for Chronic Kidney Disease (CKD) Screening of High-risk Groups in Rural Population, Shahreza, Iran

Sample	Number	Observed, %	Expected, %[4]
Population > 30 years old	11720	47	47
Hypertension	1053	9	15.6
Diabetes mellitus	311	2.7	4.9
Hypertension or diabetes mellitus	1228	10.5	16.4
First sampling	1228	100	100
Abnormal test	690	56	…
Second sampling	549	79.6	100
CKD	210	17.1	21.5

Table 2. Results of Chronic Kidney Disease (CKD) Screening of High-risk Groups in Rural Population, Shahreza, Iran

Sample	Number	Observed %	Expected %[4]
Population over 30 years old	11720	47	47
Hypertension or diabetes mellitus	1228	10.5	16.4
CKD stage			
1	27	2.2	2.75
2	67	5.5	6.82
3a	99	8.02	10.08
3b	9	0.73	0.92
4	3	0.24	0.31
5 not on dialysis	0	0	…
5 dialysis-dependent	5	…	0.17
All CKD	210	17.1	21.5

Table 3. Repeated Measurements of Albumin-Creatinine ratio and Glomerular Filtration rate in Shahreza Chronic Kidney Disease (CKD) Program

Parameter	Number of Participants	Time Point		
		1	2	3
Albumin-creatinine ratio				
No CKD	122	46.59 ± 70.85	12.65 ± 22.56	21.73 ± 47.79
CKD	108	85.10 ± 107.34	86.41 ± 153.37	75.72 ± 119.11
Glomerular filtration rate				
No CKD	139	57.93 ± 21.38	87.16 ± 34.67	74.40 ± 21.88
CKD	126	50.69 ± 19.73	58.38 ± 22.99	60.05 ± 28.65

Table 3, ACR changes were significant ($P = .009$). The mean ACR changes in the two groups with or without CKD were significant in all times ($P < .001$). The interaction between ACR measurement times and CKD group was significant ($P = .02$), which means that ACR changes were different over time. Descriptive results for GFR changes are summarized in Table 3. Changes were significant ($P < .001$). The mean ACR changes in the two groups with or without CKD were significant in all times ($P < .001$). The interaction between GFR measurement times and CKD group was significant ($P < .001$). This means that GFR changes were different over time. However, in the group without CKD, the mean GFR increased rapidly from 1 to 2, while it decreased from 2 to 3 (Table 3).

DISCUSSION

Increasing of the prevalence of CKD and increasing of treatment costs and adverse effects are a global health threat. The cost of dialysis and transplant care, as well as other chronic diseases, is increasing. Overview of the statistical analysis performed in this study showed that intervention led to the improvement of the mean GFR and ACR in the intervention group over time. However, in the group screened negative for CKD, these indicators deteriorated and CKD developed in the absent of CKD management.

One study showed that CKD stage 1 and 2 with albuminuria was compared to CKD stage 3 without albuminuria might have a worse prognosis.[17] Albuminuria is a marker of increased cardiovascular risk in non-diabetic individuals.[18] Proteinuria is a risk factor for the progress of decreased kidney function.[19-21] Chronic kidney disease is a significant risk of death from cardiovascular accidents and stroke.[22,23] The cost benefit of the quality-adjusted life years of screened people with hypertension is 19 000 dollars and in people with DM, both economic and maintainer of life. Annual screening of patients with DM and hypertension are economically benefitial.[24]

In the NAHNES study 2005-2010, distribution of impaired ACR and an estimated GFR less than 60 mL/min/1.73 m^2 in diabetic participants were 38.5% and 27.9%, respectively, and in hypertensive participants, they were 18.8% and 17%, respectively.[25] Recent data from the US Renal Data System proposes a decreasing incidence of kidney failure in some groups, perhaps showing beneficial effects of early detection and improved treatment.[26] Several interventional studies have shown that intervention for increasing physical activity, decreasing salt intake, controlling blood pressure and diabetes mellitus, and angiotensin-converting enzyme inhibitors and angiotensin receptor blockers reduce the rate of nephropathy.[27]

According to the report by the World Health Organization, the population of those with an age over 60 years in Iran is estimated to be about 34.3% (35 million people) in 2050.[28] According to our analysis, the over-60-year population of CKD stage 5 is 2%.[26] Thus, elderly population of CKD stage 5 would be estimated to be about 700 000 people. The aging of the Iranian population proceeds that older people now account for a much greater part of patients with or at risk of kidney disease and kidney failure. Old age alone will not be adequate as the basis for clinical decisions and a better approach is required—based on the comorbidities, functional status, quality of life, and choices of each unique patient.[29] Of note, similar to the study of Ghafari and colleagues in Uremia,[30] more than 70% of our participants in the rural areas were women, and so we need to implement methods to increase participation of men in screening program.

CONCLUSIONS

Prevention, care, screening, training and raising awareness for CKD in the following population groups seem to be necessary: populations with or at risk for CKD, health practitioners (primary health section, and staff in the hospitals and laboratories), and the general population. Low awareness of CKD in these three groups was probably due to no familiarity with the guidelines, the definition and classification of CKD. Screening of CKD in patients with DM and hypertension seem to be the most effective strategy.

ACKNOWLEDGEMENTS

We thank MM Baghi, F Barahimi, MH Hariri, Z Rahimi, F Rajaee, F Saidi, F Taher, and H Tanhai for their collaboration. This work was supported by resources of the Transplant and Specific Diseases office in the Ministry of Health and Medical Education and Shahreza Health Network.

CONFLICT OF INTEREST

None declared.

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Received September 2013
Revised April 2014
Accepted May 2014