Prevalence of Chronic Kidney Disease and Its Contributing Risk Factors in Southern Iran

A Cross-sectional Adult Population-based Study

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Introduction. The global prevalence of chronic kidney disease (CKD) is increasing consistently. Progression of CKD to end-stage renal disease could be slowed down by early detection and treatment, yet CKD and its risk factors have been poorly studied in many countries. This study investigated the CKD prevalence and its contributing risk factors in adult population of Southern Iran.
Materials and Methods. In this cross-sectional study on randomly recruited participants from adult population, we investigated the CKD prevalence (stages 3 to 5) and its risk factors in Southern Iran. After calculation of sample size (10 385 cases), data was collected in a total of 10 397 individuals. Medical and demographic data was obtained, as well as measurement of height, body weight, blood pressure, and blood urea nitrogen, and serum creatinine. A fresh spot urinalysis was also performed.
Results. The overall prevalence of CKD stages 3 to 5 was 11.6%. Stages 1, 2, 3, 4, and 5 of CKD were found in 8.5%, 66.1%, 11.4%, 0.1%, and 0.1% of the participants, respectively. The prevalence of CKD (stages 3 to 5) was significantly higher compared to those with the non-CKD group, in the older than younger participants, and in the women as compared to the men. There was a strong positive correlation between age, female sex, hypertension, and high body mass index with different stages of CKD.
Conclusions. The prevalence of CKD is high in Southern Iran and its contributing risk factors are older age, female sex, hypertension, and high body mass index.

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INTRODUCTION

Chronic kidney disease (CKD) is a major public health threat with a rapid increase in its global incidence and prevalence, particularly in developing countries, leading to end-stage renal disease (ESRD), and resulting in premature mortality, poor quality of life, and large burden for the health care systems.[1-15] The prevalence of CKD varies widely among nations and the study populations.[14,16,17] However, there are now clear guidelines and an internationally agreed staging system for CKD, which facilitates its diagnosis and management.[1-4] In addition, supplied population-based data on the prevalence of CKD provides the opportunity to develop stronger working relationships with the primary care teams, to plan health resource allocation, and also to detect and treat CKD in its early course.[18]

Unfortunately, lack of information concerning epidemiologic characteristics of CKD and its contributing risk factors outside of the United

States, especially in developing countries, result in lost opportunities for appropriate intervention and prevention of the consequent ESRD. Although we have reported previously that hypertension and diabetes mellitus to be the most common causes of ESRD in Southern Iran, up to date, no population-based study addressing the issue have been carried out in this part of the world.[19] Therefore, in this study, we investigated the prevalence of CKD and its contributing risk factors in adult population of Southern Iran.

MATERIALS AND METHODS

Study Population

This is a cross-sectional population-based study conducted by Shiraz Nephro-Urology Research Center of Shiraz University of Medical Sciences in Southern Iran. Of 10 397 individuals studied during a 2-year period (September 2009 to December 2011), a total of 9404 adult persons of either sex with complete data were enrolled in this survey. Inclusion criteria were age of 18 years and over and provision of consent to participate in the study. This study complied with the Declaration of Helsinki and was approved by the local Ethics Committee. All studied individuals provided written informed consent.

For calculation of sample size, with estimation error of 1% and an assumed prevalence of CKD of 9% based on estimates of a recent study carried out in the population of Central Iran (Tehran),[20] we obtained a sample size of 3147. With design effects of 3.0 for sampling method, 9441 samples were required. Also based on 10% missing data estimation the required samples size of 10 385 cases was calculated. According to a multistage stratified cluster random sampling, Southern Iran was subdivided to certain geographic areas. After randomly selecting a city from each area divided into urban and rural parts, and based on population proportional, the required sample size was chosen.

In this study, data from 10 397 individuals were collected, and after excluding the missing data, analysis conducted on 9404 participants. The selected participants were invited to visit the Local Health Centers where detailed evaluation was performed.

Measurements

For all participants, a questionnaire was completed that included all demographic data and medical history by face-to-face interviews. Physical examinations (measurement of height, weight, and blood pressure) and specific laboratory tests were undertaken by trained health providers. Blood samples for measuring the levels of blood urea nitrogen (BUN) and serum creatinine levels were collected from the antecubital vein. Blood specimens were centrifuged on-site and transported to the reference laboratory in Shiraz. Serum creatinine and BUN measurements were performed by using the Jaffe modified kinetic method and kinetic ultraviolet method, respectively. A spot fresh urinalysis (dipstick and light microscopic examination) was performed in all of the particiants.

Definitions

According to the Kidney Disease Outcome Quality Initiative guideline, CKD Stage 1 was defined as estimated glomerular filtration rate (GFR) greater than 90 mL/min/1.73 m^2, with evidence of kidney damage; Stage 2, as estimated GFR between 60 mL/min/1.73 m^2 and 89 mL/min/1.73 m^2 (mild decrease in GFR); stage 3, as estimated GFR between 30 mL/min/1.73 m^2 and 59 mL/min/1.73 m^2 (moderate decrease in GFR; stage 3A, $\geq$ 45 mL/min/1.73 m^2 and stage 3B, < 45 mL/min/1.73 m^2); stage 4, estimated GFR between 15 mL/min/1.73 m^2 and 29 mL/min/1.73 m^2 (severe decrease in GFR); and stage 5, estimated GFR less than 15 mL/min/1.73 m^2 (dialysis-dependent; kidney failure).

The CKD stages of 3 to 5 with either kidney damage or a GFR less than 60 mL/min/1.73 m^2 were considered as CKD group.[3,4] The non-CKD group was defined as the normal group (GFR, > 90 mL/min/1.73 m^2 and normal kidney function) and CKD stages of 1 and 2. Estimated GFR was calculated using the Modification of Diet in Renal Disease (MDRD) equation.[7,15,16,18]

Body mass index (BMI) was calculated as body weight (in kilograms) divided by squared height (in meters) and categorized into 3 groups of less than 25 kg/m^2, 25 kg/m^2 to 30 kg/m^2, and 30 kg/m^2 and greater. Hypertension was defined as systolic blood pressure higher than 130 mm Hg or diastolic blood pressure higher than 80 mm Hg. Also, patients who had a positive history of hypertension and were receiving antihypertensive medications were categorized in the hypertension

group. Blood pressure was taken 2 times after resting for at least 15 minutes using standard adult mercury sphygmomanometer. The average of the two readings was recorded.

Statistical Analysis

Data were analyzed by the SPSS software (Statistical Package for the Social Sciences, version 15.0, SPSS Inc, Chicago, Ill, USA). Qualitative data were expressed as number and percentage and were analyzed using the chi-square test. Quantitative data were presented as mean and standard deviation. Comparison of quantitative data was done by the independent *t* test. A multivariate logistic regression model was used to estimate the odds ratio of significant risk factors of CKD. Age, sex (reference, male), BMI (reference, < 25 kg/m^2), hypertension, and history of DM, in dichotomous fashions were considered as independent variables. A *P* value less than .05 was considered significant.

RESULTS

Table 1 shows distribution of the participants based on the stages of CKD by sex. The overall prevalence of CKD stages 3 to 5 was 11.6% (14.9% in women and 5.4% in men), while 8.5% and 66.1% of the participants were in CKD stages 1 and 2, respectively. The prevalence of CKD stage 3 was significantly higher in women than in men, but women were less frequent in the non-CKD group than men. As shown in Table 2, the overall prevalence of CKD (stages 3 to 5) was significantly higher in older age group and women as compared to the non-CKD group. This significance was more prominent in the elderly age group (≥ 60 years) and housewives. Moreover, governmental employees had significantly lower prevalence of CKD (stages 3 to 5) as compared to the non-CKD group.

In Table 3, correlations between risk factors and different stages of CKD are shown. There was a strong positive correlation between age, female sex, BMI, and hypertension with different stages

Table 1. Distribution of Chronic Kidney Disease (CKD) Stages by Sex*

CKD	Total (n = 9404)	Women (n = 6028)	Men (n = 3376)	*P*
Normal group	1312 (14.0)	534 (8.9)	778 (23.0)	< .001
Stage 1	798 (8.5)	278 (4.6)	520 (15.4)	< .001
Stage 2	6214 (66.1)	4316 (71.6)	1898 (56.2)	< .001
Stage 3	1069 (11.4)	893 (14.8)	176 (5.2)	
3A	945 (88.4)	779 (87.2)	166 (94.3)	< .001
3B	124 (11.6)	114 (12.8)	10 (5.7)	.006
Stage 4	6 (0.1)	4 (0.5)	2 (0.1)	> .99
Stage 5	5 (0.1)	3 (0.04)	2 (0.1)	> .99

*Values in parentheses are percentages.

Table 2. Comparison of Participants With and Without Chronic Kidney Disease (CKD)*

Parameters	Total (n = 9404)	CKD		*P*
		No (n = 8324)	Yes (n = 1080)	
Mean age, y	39.8 ± 14.9	38.3 ± 14.2	51.0 ± 15.6	< .001
Age				
18 to 39 y	5155 (54.8)	4866 (58.5)	289 (26.8)	
39 to 59 y	3059 (32.5)	2639 (31.7)	420 (38.9)	
≥ 60 y	1190 (12.7)	819 (9.8)	371 (34.4)	< .001
Sex				
Male	3376 (35.9)	3196 (38.4)	180 (16.7)	
Female	6028 (64.1)	5128 (61.6)	900 (83.3)	< .001
Employment				
Housewife	4298 (45.7)	3646 (43.8)	652 (60.3)	
Government employee	950 (10.1)	857 (10.3)	93 (8.5)	
Others	4156 (44.2)	3821 (45.9)	335 (31.2)	< .001

*Values in parentheses are percentages.

Table 3. Significant Risk Factors in Multivariable Logistic Regression Model for Chronic Kidney Disease Stages

Factor	β	Odds Ratio	95% Confidence Interval	*P*
Female sex	1.38	3.97	3.42 to 4.57	< .001
Hypertension	0.22	1.24	1.08 to 1.43	.003
Age	0.06	1.06	1.06 to 1.13	< .001
Body mass index	0.02	1.02	1.01 to 1.04	< .001
Diabetes mellitus	0.19	1.20	0.91 to 1.38	.26

of CKD. Table 4 shows correlation between risk factors and different stages of CKD in relation to their sex distribution. There was a strong positive correlation between BMI, age, and hypertension with prevalence of CKD in both men and women. As demonstrated in Table 5, housewives were significantly older and had significantly higher BMI and blood pressure as well as positive history of diabetes mellitus compared to their non-housewives counterpart. In addition, governmental employees were significantly younger and had significantly lower blood pressure and BMI compared to nongovernmental employees.

DISCUSSION

Chronic kidney disease is a major worldwide public health hazard. Its global prevalence is rapidly and steadily increasing, particularly in developing countries. Most of the time asymptomatic progression of CKD to ESRD necessitates highly expensive therapies that cannot be afforded by most of the victims, and those who can afford are at higher risk for dreadful complications of renal replacement therapies such as cardiovascular disease and infection.[1-15,21-24] Although current concept suggests that if CKD is detected and treated early in the course of the disease, the consequent ESRD and its adverse outcomes could be delayed or even prevented. However, unfortunately the condition has been poorly studied outside of the United States, particularly in developing countries such as Iran, and due to lack of information about CKD and its contributory risk factors, opportunities are lost for early intervention and prevention of ESRD and its dreadful complications.

Some prior reports have assessed the prevalence of CKD in Iran. Its prevalence was 18.9% among 10 063 people aged over 20 years, in Tehran, Iran in 2000.[25] A study during 2002 to 2005 reported that the CKD prevalence (stags 1 to 5) was 12.6% in 17 240 Iranian people.[20] Another study conducted in 1557 Iranian samples showed 19.5% prevalence for CKD (stages 1 and 2, 10.6%; stages 3 to 5, 8.9%).[26] Also in a cohort study on 3313 non-CKD Iranians aged

Table 4. Significant Risk Factors in Multivariable Logistic Regression Model for Chronic Kidney Disease Stages Stratified by Sex

Factor	β	Odds Ratio	95% Confidence Interval	*P*
Women				
Age	0.06	1.06	1.06 to 1.07	< .001
Body mass index	0.03	1.03	1.02 to 1.05	< .001
Hypertension	0.24	1.27	1.10 to 1.53	.01
Diabetes mellitus	0.16	1.17	0.91 to 1.50	.21
Men				
Age	0.06	1.07	1.06 to 1.07	< .001
Body mass index	0.02	1.03	1.01 to 1.05	< .001
Hypertension	0.19	1.21	0.96 to 1.53	.03
Diabetes mellitus	0.03	1.03	0.70 to 1.51	.88

Table 5. Comparison of Risk Factors for Chronic Kidney Disease Between Participants With Different Employment Status*

Factor	Housewife	Not housewife	*P*	Government Employee	Not government Employee	*P*
Age	41.2 ± 14.6	37.2 ± 14.3	< .001	37.9 ± 10.7	40.8 ± 16.0	< .001
Body mass index	26.20 ± 4.28	24.74 ± 4.15	< .001	24.68 ± 3.13	24.24 ± 3.76	.01
Hypertension	721 (21.0)	183 (7.0)	< .001	56 (17.3)	399 (13.0)	.03
Diabetes mellitus	304 (8.9)	73 (4.7)	< .001	14 (4.3)	134 (5.8)	.16

*Values are mean ± standard deviation for age and body mass index and frequency (percentage) for hypertension and diabetes mellitus.

20 years and over, the incidence rates of CKD was reported as 285.3 and 132.6 per 10 000 person-year, among women and men, respectively.[27] However, the prevalence of CKD varies considerably between men and women, also among nations and in the studied populations.[2,14,16,17] In published series to date, African-Americans had a lower prevalence than Caucasians and Asian populations had a relatively higher prevalence than Caucasians.[16] In a systematic review of 26 studies performed in 2008, the median prevalence of CKD was shown to be 7.2% in persons over 29 years old.[17] The prevalence of CKD with a GFR less than 60 mL/min/1.73 m^2 varied from 3.7% to 15.5% in men and from 10.9% to 22.6% in women.[9,18,28]

In the present cross-sectional population-based study carried out for the first time in this part of the world, we found that the prevalence of CKD of stages 3 to 5 was 11.4% (5.2% in men and 14.8% in women). Similar to the previously published studies, the prevalence of CKD stage 3 and non-CKD group were significantly higher and lower respectively in women as compared to men.[16,26] It has been shown that older age, particularly age of 60 years and older, is a major contributor risk factor to prevalence of CKD in different nations.[1,10,16,18] Similarly, we found the prevalence of CKD to be significantly higher in the older age groups, especially in those over 60 years old.

Interestingly in this study, we showed for the first time that the prevalence of CKD was significantly higher in Southern Iranian housewives. Our results also revealed that Iranian housewives were significantly older and had significantly higher BMI and hypertension also positive history of diabetes mellitus as compared to their non-housewives counterparts. Thus, it seems that a higher prevalence of CKD in housewives stems in aging, obesity, hypertension, and diabetes mellitus in Southern Iran. Although it has not been studied, in our daily practice, we are increasingly encountering obese housewives who are busy with their routine indoor tasks without any proper facilities for daily sportily exercise, however our observation if true remains to be proved. Nonetheless, our finding shows that housewives of Southern Iran were highly at risk for developing CKD, indicating the need for more investigation aiming to correct the contributing risk factors that makes them vulnerable to CKD.

For the first time in this study, we demonstrated that the prevalence of CKD was significantly lower in governmental employees than nongovernmental employees. However, all governmental employees are routinely investigated for detection of any disease before employment. Therefore, they are a selected population with significantly lower BMI and hypertension as our result shows resulting in lower prevalence of CKD in this group of population. Also, they were significantly younger as compared to their nongovernmental employees, contributing in part to lower prevalence of CKD in them.

Diabetes mellitus has been shown to be associated with higher prevalence of CKD in previously published reports of CKD.[1,10,17,26] On the contrary, we did not find a significant positive correlation between a history of diabetes mellitus and prevalence of CKD, except for the housewives. However, our study is limited for diagnosis of diabetes mellitus, because we failed to measure blood glucose (fasting and 2 hours postprandial blood glucose) as well as hemoglobin A1C, due to budget restriction. Therefore, we are not able to draw a valid conclusion about the contributory role of diabetes mellitus to prevalence of CKD. However, regarding our previous report which disclosed diabetes mellitus as a common cause of ESRD in Southern Iran,[19] it seems wise to carry out more population-based studies with measurement of blood glucose and hemoglobin A1c to clarify the role of diabetes mellitus in relation to the prevalence of CKD in Southern Iran. It is known that hypertension to be a major risk factor for CKD and its consequent cardiovascular disease, to comply with these published series.[1,10,17,20,26,28] In the present study, hypertension was associated with significantly higher CKD prevalence in the studied population, as well as in both men and women, indicating the importance of early detection and treatment of hypertension in Southern Iran.

Body mass index has been blamed as one of the independent contributory risk factors to prevalence of CKD and consequent cardiovascular disease.[29-31] Likewise, we found a positive correlation between BMI and prevalence of CKD in this study. Therefore, we speculate that obesity and higher BMI might be a major contributor risk factor for development of CKD in Southern Iran, indicating the importance of population-based study for disclosing prevalence of obesity in this part of world. Also, our findings

mandate the importance of nutritional and medical guidelines to change life style of Southern Iran population, particularly the elderly and housewives.

CONCLUSIONS

The prevalence of CKD is high in Southern Iran. The major contributory risk factors are age, female sex, higher BMI, and hypertension. Our findings indicate the importance of nutritional and life style guidelines and mass teaching programs with regard to CKD and its dreadful complications in Southern Iran. In addition, it mandatory to encourage medical staff for prevention of CKD by early detection and treatment of its contributing risk factors.

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CONFLICT OF INTEREST

None declared.

REFERENCES

1. Chadban SJ, Briganti EM, Kerr PG, et al. Prevalence of kidney damage in Australian adults: The AusDiab kidney study. J Am Soc Nephrol. 2003;14:S131-8.
2. Levey AS, Coresh J, Balk E, et al. National Kidney Foundation practice guidelines for chronic kidney disease: evaluation, classification, and stratification. Ann Intern Med. 2003;139:137-47.
3. Eckardt KU, Berns JS, Rocco MV, Kasiske BL. Definition and classification of CKD: the debate should be about patient prognosis--a position statement from KDOQI and KDIGO. Am J Kidney Dis. 2009;53:915-20.
4. [No author listed]. K/DOQI clinical practice guidelines for chronic kidney disease: evaluation, classification, and stratification. Am J Kidney Dis. 2002;39:S1-266.
5. Levey AS, Andreoli SP, DuBose T, Provenzano R, Collins AJ. CKD: common, harmful, and treatable--World Kidney Day 2007. Am J Kidney Dis. 2007;49:175-9.
6. [No author listed]. Prevalence of chronic kidney disease and associated risk factors--United States, 1999-2004. MMWR Morb Mortal Wkly Rep. 2007;56:161-5.
7. White SL, Polkinghorne KR, Atkins RC, Chadban SJ. Comparison of the prevalence and mortality risk of CKD in Australia using the CKD Epidemiology Collaboration (CKD-EPI) and Modification of Diet in Renal Disease (MDRD) Study GFR estimating equations: the AusDiab (Australian Diabetes, Obesity and Lifestyle) Study. Am J Kidney Dis. 2010;55:660-70.
8. Iseki K. Chronic Kidney Disease in Japan. Intern Med. 2008;47:681-9.
9. Van Biesen W, Vanholder R, Veys N, et al. The importance of standardization of creatinine in the implementation of guidelines and recommendations for CKD: implications for CKD management programmes. Nephrol Dial Transplant. 2006;21:77-83.
10. Li ZY, Xu GB, Xia TA, Wang HY. Prevalence of chronic kidney disease in a middle and old-aged population of Beijing. Clin Chim Acta. 2006;366:209-15.
11. Barsoum RS. Chronic kidney disease in the developing world. N Engl J Med. 2006;354:997-9.
12. Mahon A. Epidemiology and classification of chronic kidney disease and management of diabetic nephropathy. Business Brief Eur Endocrin Rev. 2006;33-6.
13. Krzesinski JM, Sumaili KE, Cohen E. How to tackle the avalanche of chronic kidney disease in sub-Saharan Africa: the situation in the Democratic Republic of Congo as an example. Nephrol Dial Transplant. 2007;22:332-5.
14. Dash SC, Agarwal SK. Incidence of chronic kidney disease in India. Nephrol Dial Transplant. 2006;21:232-3.
15. Skali H, Uno H, Levey AS, Inker LA, Pfeffer MA, Solomon SD. Prognostic assessment of estimated glomerular filtration rate by the new Chronic Kidney Disease Epidemiology Collaboration equation in comparison with the Modification of Diet in Renal Disease Study equation. Am Heart J. 2011;162:548-54.
16. Singh NP, Ingle GK, Saini VK, et al. Prevalence of low glomerular filtration rate, proteinuria and associated risk factors in North India using Cockcroft-Gault and Modification of Diet in Renal Disease equation: an observational, cross-sectional study. BMC Nephrol. 2009;10:4.
17. Alsuwaida AO, Farag YM, Al Sayyari AA, et al. Epidemiology of chronic kidney disease in the Kingdom of Saudi Arabia (SEEK-Saudi investigators) - a pilot study. Saudi J Kidney Dis Transpl. 2010;21:1066-72.
18. Imai E, Horio M, Iseki K, et al. Prevalence of chronic kidney disease (CKD) in the Japanese general population predicted by the MDRD equation modified by a Japanese coefficient. Clin Exp Nephrol. 2007;11:156-63.
19. Malekmakan L, Haghpanah S, Pakfetrat M, Malekmakan A, Khajehdehi P. Causes of chronic renal failure among Iranian hemodialysis patients. Saudi J Kidney Dis Transpl. 2009;20:501-4.
20. Safarinejad MR. The epidemiology of adult chronic kidney disease in a population-based study in Iran: prevalence and associated risk factors. J Nephrol. 2009;22:99-108.
21. Nafar M, Mousavi SM, Mahdavi-Mazdeh M, et al. Burden of chronic kidney disease in Iran: a screening program is of essential need. Iran J Kidney Dis. 2008;2:183-92.
22. Mahdavi-Mazdeh M. Why do we need chronic kidney disease screening and which way to go? Iran J Kidney Dis. 2010;4:275-81.
23. Monfared A, Safaei A, Panahandeh Z, Nemati L. Incidence of end-stage renal disease in Guilan Province, Iran, 2005 to 2007. Iran J Kidney Dis. 2009;3:239-41.
24. Aghighi M, Mahdavi-Mazdeh M, Zamyadi M, Heidary Rouchi A, Rajolani H, Nourozi S. Changing epidemiology of end-stage renal disease in last 10 years in Iran. Iran J Kidney Dis. 2009;3:192-6.
25. Hosseinpanah F, Kasraei F, Nassiri AA, Azizi F. High

prevalence of chronic kidney disease in Iran: a large population-based study. BMC Public Health. 2009;9:44.

26. Najafi I, Shakeri R, Islami F, et al. Prevalence of chronic kidney disease and its associated risk factors: the first report from Iran using both microalbuminuria and urine sediment. Arch Iran Med. 2012;15:70-5.
27. Tohidi M, Hasheminia M, Mohebi R, et al. Incidence of chronic kidney disease and its risk factors, results of over 10 year follow up in an Iranian cohort. PLoS One. 2012;7:e45304.
28. Mahdavi-Mazdeh M, Saeed Hashemi Nazri S, Hajghasemi E, Nozari B, Zinat Nadia H, Mahdavi A. Screening for decreased renal function in taxi drivers in Tehran, Iran. Ren Fail. 2010;32:62-8.
29. Marwyne MN, Loo CY, Halim AG, Norella K, Sulaiman T, Zaleha MI. Estimation of glomerular filtration rate using serum cystatin C in overweight and obese subjects. Med J Malaysia. 2011;66:313-7.
30. Emem-Chioma PC, Siminialayi IM, Wokoma FS. Prevalence of chronic kidney disease in adults with metabolic syndrome. Saudi J Kidney Dis Transpl. 2011;22:949-54.
31. Zhang YM, Su SS, Muhu YT. [Study on the relationship between metabolic syndrome and chronic kidney disease in 1027 patients of Han and Uyguer people]. Zhonghua Liu Xing Bing Xue Za Zhi. 2008;29:493-6. Chinese.

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