



Limited knowledge of chronic kidney disease and its main risk factors among Iranian community: an appeal for promoting national public health education programs

Peyman Roomizadeh^{1,2,*}, Diana Taheri^{1,3}, Amin Abedini^{1,2}, Mojgan Mortazavi^{1,4}, Mehrdad Larry⁵, Bahareh Mehdikhani⁵, Seyed-Mojtaba Mousavi^{1,2}, Farid-Aldin Hosseini^{1,2}, Aidin Parnia^{1,2}, Manouchehr Nakhjavani⁵

Abstract

Background: The aim of this survey was to explore the baseline knowledge of the Iranian community about Chronic Kidney Disease (CKD) definition and its two main risk factors, i.e. diabetes and hypertension. This study also introduced a model of public education program with the purpose of reducing the incidence of CKD in high-risk groups and thereby decreasing the economic burden of CKD in Iran.

Methods: This cross-sectional study was conducted on world kidney day 2013 in Isfahan, Iran. Self-administered anonymous questionnaires evaluating the knowledge of CKD and its risk factors were distributed among subjects who participated in a kidney disease awareness campaign. Chi-square test and logistic regression analysis were used to examine the differences in the level of knowledge across different socio-demographic groups.

Results: The questionnaires were completed by 748 respondents. The majority of these respondents believed that “pain in the flanks” and “difficulty in urination” was the early symptoms of CKD. Roughly, 10.4% knew that CKD could be asymptomatic in the initial stages. Only 12.7% knew diabetes and 14.4% knew hypertension was a CKD risk factor. The respondents who had a CKD risk factor (i.e. diabetes and/or hypertension) were significantly more likely than respondents without CKD risk factor to select “unmanaged diabetes” [Odds Ratio (OR)= 2.2, Confidence Interval (CI) (95%): 1.4–3.6] and “unmanaged hypertension” [OR= 1.9, CI(95%): 1.2–3.0] as “very likely to result in CKD”. No more than 34.6% of all respondents with diabetes and/or hypertension reported that their physician has ever spoken with them about their increased risk for developing CKD.

Conclusion: The knowledge of Iranian population about CKD and its risk factors is low. Future public health education programs should put efforts in educating Iranian community about the asymptomatic nature of CKD in its initial stages and highlighting the importance of regular renal care counseling. The high-risk individuals should receive tailored education and be encouraged to adopt lifestyle modifications to prevent or slow the progression of CKD.

Keywords: Chronic Kidney Disease (CKD), Knowledge, Diabetes, Hypertension, Prevention, Iran

Copyright: © 2014 by Kerman University of Medical Sciences

Citation: Roomizadeh P, Taheri D, Abedini A, Mortazavi M, Larry M, Mehdikhani B, *et al.* Limited knowledge of chronic kidney disease and its main risk factors among Iranian community: an appeal for promoting national public health education programs. *Int J Health Policy Manag* 2014; 2: 161–166. doi: 10.15171/ijhpm.2014.37

Article History:

Received: 19 March 2014

Accepted: 20 April 2014

ePublished: 24 April 2014

*Correspondence to:

Peyman Roomizadeh

Email: roomizadeh@gmail.com

Introduction

Chronic Kidney Disease (CKD) is becoming a major health concern worldwide. For many patients, CKD is associated with substantial morbidity and mortality (1,2). Diabetes and hypertension are two major risk factors for CKD (3,4). Since the initial stages of CKD can be asymptomatic, early disease detection is difficult. In undiagnosed and untreated individuals CKD may gradually progress to End Stage Renal Disease (ESRD), the terminal stage of CKD when costly Renal Replacement Therapy (RRT) via dialysis or renal transplantation becomes necessary to sustain the patient's life (5).

In Iran, the prevalence of CKD is increasing. Large cohort studies have shown that approximately 2% of Iranian adults develop CKD each year (6). The economic burden of RRT modalities has increased significantly over the past decade (7,8). It is generally agreed that CKD prevention is the best health policy for reducing the costs of this disease in the developing countries which have limited healthcare resources

(8,9). Several studies have demonstrated that individuals who are provided with appropriate information and knowledge about CKD and its risk factors are more likely to engage in health-promoting behaviors and life style modifications to maintain an optimal blood sugar and blood pressure levels (10–14). Therefore, improving the public's knowledge about CKD and its risk factors is an important strategy for CKD prevention.

The aim of this survey is to explore the baseline knowledge of Iranian community about CKD definition and its two main risk factors, i.e. diabetes and hypertension. This study also introduced a model of public education program with the purpose of reducing the incidence of CKD in high-risk groups and thereby decreasing the economic burden of CKD in Iran.

Methods

Study setting

This cross-sectional study was conducted in Isfahan, a large province located in central Iran. According to Iranian national

census performed in 2011, the population of Isfahan was about 4,879,312 inhabitants.

On March 14th, 2013, the world kidney day, Isfahan Kidney Diseases Research Center organized kidney diseases awareness campaigns in the main city park of Isfahan with the purpose of advancing public awareness about kidney diseases and preventive measures (15). The kidney disease educators were nephrologists, nephrology fellows, internists, and medical students. Interested individuals who attended this campaign were invited to fill out questionnaires assessing their basic knowledge of CKD, its definition, and risk factors. The only inclusion criterion for participation in this survey was that participants be 18 years of age or older. Participation in the survey was voluntary and all respondents were assured that the questionnaires would remain anonymous and confidential. The questionnaires were field under the supervision of trained researchers. For those who were not able to read and write the researcher read the questions and documented their responses. Upon completion of the questionnaires, the participants were invited to join the kidney diseases educational exhibitions and were provided with renal healthcare leaflets and brochures and received the appropriate disease education on the risk factors involved with CKD.

Questionnaires and survey

The questionnaire used in this study was developed based on the kidney disease knowledge evaluation questionnaire originated by the National Kidney Disease Education Program (NKDEP) (16). Also a number of previous CKD knowledge surveys (10,17–19) were used for this purpose. A panel of institutional experts (nephrologists and health professionals) designed and wrote the questionnaire in the Persian language

with modifications according to Iranian social and cultural characteristics. On February 2013, the questionnaire was pre-tested in a pilot study comprised of 45 respondents to ensure its clarity and relevance. The pilot-study results were reviewed critically and further minor modifications were made to improve the clarity and comprehensibility of the questions. The estimated time for completing the questionnaire was approximately 12 minutes. The results of the pre-test were not included in the final analyses. The questionnaire used for this study is provided in Table 1.

Statistical analysis

Continuous values are expressed as mean \pm SD and categorical variables are presented as numbers (percentage). For comprehensive evaluation of the knowledge of different groups of the respondents, they were divided based on socio-demographic and medical characteristics. According to the socio-demographic features, respondents were divided into three categories as follows: a) high school/college education or lower than high school/illiterate; b) younger than 65 years of age or older than 65 years of age; c) females or males. Furthermore, respondents were divided in two categories according to their medical status: a) respondents with a CKD risk factor (i.e. diabetes and/or hypertension); and b) respondents without a CKD risk factor. Chi-square test was used to examine whether there was a significant difference in the knowledge of CKD risk factors between these two groups. For each analysis with significant results, we used logistic regression analysis in order to generate odds ratios as well as 95% confidence intervals. All statistical analyses were conducted using SPSS software version 19.0 (SPSS, Chicago, IL, USA). $P < 0.050$ was considered the significance threshold.

Table 1. The questionnaire used in the study

Questions	Possible answers
Age	... years
Gender	a) Male; b) Female
Level of education	a) Illiterate; b) Less than high school; c) High school graduate; d) College education
Occupational status	a) Unemployed; b) Worker/farmer; c) Government employee; d) Self-employed
What do you think CKD is?	a) An infection of the kidneys; b) Reduction in kidneys' ability to remove wastes from the blood; c) An inflammation of the kidneys; d) A stone of the kidneys; e) Do not know/no response
Which of the following symptoms/signs can manifest in early stages of CKD?	a) Pain in the flanks; b) Difficulty in urination; c) Change in smell/color of the urine; d) Urinating too little; e) Urinating too much; f) CKD can be asymptomatic until advanced stages; g) Do not know/no response
Choose two of the following diseases/conditions that you think are very likely to result in CKD.	a) Drinking too much water; b) Drinking low water; c) Smoking; d) Unmanaged diabetes; e) Unmanaged hypertension; f) Being male; g) Being female; h) Do not know/no response
Do you have diabetes? (As confirmed by a physician)	a) Yes; b) No
Do you have hypertension? (As confirmed by a physician)	a) Yes; b) No
If you have diabetes, has your doctor ever talked to you about your risk for developing CKD?	a) Yes; b) No
If you have hypertension, has your doctor ever talked to you about your risk for developing CKD?	a) Yes; b) No
How often do you counsel with your doctor/healthcare provider about your renal function?	a) Every 6 months; b) Every 12 months; c) Every 2 years; d) More than every 2 years; e) Do not know/remember
When was the last time that you have been tested for renal function?	a) Less than 6 months ago ; b) Between 6 and 12 months ago; c) Between 1 and 2 years ago; d) More than 2 years ago; e) Never been tested for renal function; f) Do not know/remember

The choices were presented in alphabetical order of Persian language to avoid giving precedence to any specific answer.

Results

Respondents' characteristics

Of the 843 volunteers who participated in this survey, 748 respondents completed the questionnaires appropriately (88.7% cooperation rate). Of these respondents 54.1% were female. The mean age of the respondents was 46.7 ± 19.5 years (range: 18–85 years). 78.5% of the respondents were within the age group of 18–65 years and 82.4% had high school or college education. With regards to CKD risk factors, a total of 20.4% reported to have a CKD risk factor. They were comprised of 12.5% with only hypertension, 2.7% with only diabetes, and 5.2% with both hypertension and diabetes. The details of demographic characteristics of the respondents are presented in Table 2.

Knowledge of CKD and its risk factors

The most frequent answers to the question “What do you think CKD is?” were “an inflammation of the kidneys” (28.2%) and “Reduction in kidneys' ability to remove wastes from blood” (27.8%). Other frequent answers were “infection of the kidneys” (18.0%), “kidney stone” (17.6%), and “Do not know/no response” (8.3%). When respondents were asked “Which of the following symptoms/signs can manifest in early stages of CKD”, 28.3% responded “pain in the flanks”, 21.8% responded “difficulty in urination”, 14.4% responded “urinating too much”, 10.4% responded “change in smell/color of the urine”, and 10.3% responded “urinating too little”. Only 10.4% identified the correct answer “CKD can be asymptomatic until advanced stages”. The remaining

4.4% responded “Do not know/no response”. There were no significant differences in identifying the correct answer in terms of gender, education, or age.

The general knowledge of the respondents about CKD risk factors was quite low. When respondents were asked “Choose two of the following diseases/conditions that you think are very likely to result in CKD” they most frequently selected “smoking” (21.8%), “drinking low water” (16.8%), and “drinking too much water” (14.3%). Only 12.7% identified “unmanaged diabetes” and 14.4% identified “unmanaged hypertension” as the correct answers. Respondents who had a CKD risk factor (i.e. diabetes and/or hypertension) were significantly more likely than respondents without CKD risk factor to select “diabetes” (21.2% vs 10.6%; $\chi^2 = 11.3$; $P < 0.001$) and “hypertension” (21.9% vs 12.6%; $\chi^2 = 7.6$; $P < 0.050$) as “very likely to result in CKD”. In Logistic regression analysis, the Odds Ratios (OR) for selecting “diabetes” and “hypertension” as “very likely to result in CKD” in respondents with a CKD risk factor were 2.27 [Confidence Interval (CI) (95%): 1.4–3.6] and 1.9 (CI (95%): 1.2–3.0) compared with respondents without CKD risk factor, respectively.

With regard to socio-demographic features, respondents who had high school/college education, female gender, and lower than 65 years of age tended to select “diabetes” and “hypertension” as “very likely to result in CKD”; however, these differences did not reach the significant threshold (Table 3).

Attitude of respondents towards CKD prevention

Lastly, the attitude and behavior of the respondents towards CKD prevention was evaluated. When participants were asked “How often do you counsel with your doctor/healthcare provider about your renal function?” They most common answers were “more than every 2 years” (44.1%), “Do not know/remember” (18.9%) and “every 2 years” (17.5%). Only 39.7% of the respondents reported that they remember the last time that they had a renal function test. Among respondents who had a CKD risk factor, only 34.6% reported that their physician has ever spoken with them about their increased risk for developing CKD.

Discussion

In this study, we assessed the knowledge and awareness of Iranian community regarding CKD and its two main risk factors including diabetes and hypertension. Based on our findings, the overall knowledge of Iranian community regarding CKD and its risk factors was quite low. Only 12.7% of the respondents selected “unmanaged diabetes” and 14.4% selected “unmanaged hypertension” as “very likely to result in CKD”. These observations suggest that many Iranians are not adequately informed on the subject of the significant role of unmanaged diabetes/hypertension in the development of CKD.

The findings of our CKD knowledge survey in Iran are comparable to previous CKD knowledge surveys from those of developed countries. A survey in a large number of African-American adult populations revealed that only 13.6% knew diabetes and 12.1% knew hypertension was a CKD risk factor (16). In another study of Australian adults, the knowledge of CKD risk factors was even lower. Only 8.6% of Australians knew diabetes and 2.8% knew hypertension was a CKD risk

Table 2. Socio-demographic characteristics of the participants

Age	Total Respondents (n=748)
	Number (%)
18–65 years	587 (78.5%)
> 65 years	161 (21.5%)
Gender	
Male	343 (45.9%)
Female	405 (54.1%)
Educational status	
High school graduate	314 (41.9%)
College education	303 (40.5%)
Less than high school	107 (14.3%)
Illiterate	24 (3.2%)
Occupational status	
Student	219 (29.3%)
Government employee	168 (22.4%)
Self-employed	280 (37.4%)
Farmer/worker	44 (5.9%)
Unemployed	37 (4.9%)
Risk factors	
Hypertension	94 (12.5%)
Diabetes	20 (2.7%)
Both diabetes and hypertension	39 (5.2%)

Values are presented as number (percentage).

Table 3. The influence of socio-demographic characteristics on the knowledge of CKD risk factors

Demographic Characteristics		Selected diabetes as "very likely to result in CKD"	P-value	Selected hypertension as "very likely to result in CKD"	P-value
Age	Lower than 65	12.9 %	0.830	14.5%	0.928
	Higher than 65	11.8%		14.3%	
Gender	Females	13.6%	0.459	15.3%	0.567
	Males	11.7%		13.4%	
Educational Status	High school/college	13.1%	0.536	14.5%	0.959
	Lower than high school	10.7%		14.4%	

factor (17). In our survey, we found that respondents who had a CKD risk factor (i.e. diabetes/hypertension) were more likely than other respondents to identify the risk factors involved with CKD correctly. This observation was in line with the results of the CKD knowledge surveys in African-Americans (16) and Australians (17). In the survey among African-Americans, the authors reported that respondents with diabetes, hypertension, or family history of kidney disease were more likely than other respondents to know the CKD risk factors (16). In addition, in the survey among Australian adults, the awareness of a "relationship between diabetes and CKD" was significantly higher in diabetic patients compared to the non-diabetic ones (17).

In our study, although respondents with a CKD risk factor had a higher knowledge than the general population, the majority of them were not aware of the association between unmanaged diabetes/hypertension and CKD. Only 21.2% of the respondents with a CKD risk factor knew "unmanaged diabetes" and 21.9% knew "unmanaged hypertension" are "very likely to result in CKD". These findings suggested that a significant proportion of Iranians with diabetes or hypertension have not been appropriately informed of their increased risk for developing CKD. We believe this can be due to a limited or even lack of communication between these patients and their physicians regarding the association of diabetes/hypertension and CKD. This assumption is supported by the observation that only 34.6% of our respondents with diabetes/hypertension reported that their physician had ever spoken to them about their increased risk for developing CKD. These findings indicate a necessity for the physicians to improve their communication with the patients regarding the influence of diabetes and hypertension in the development of CKD.

In our study, we did not find a significant relationship between socio-demographic features and the knowledge of CKD. The respondents with higher education, female gender, and lower age showed a tendency to have more knowledge of CKD risk factors; however, these differences were non-significant (Table 3). In contrast to our observations, the influence of socio-demographic characteristics on the level of CKD knowledge was demonstrated in a number of previous studies. In a study by Chow *et al.* the authors reported that respondents with older age, lower educational status, and lower monthly income were more likely to have a limited knowledge on CKD (10). Moreover, in a number of previous studies, the authors have reported an association between lower socio-economic/educational status and a lower knowledge level of hypertension (20) and diabetes (21). The discrepancy between our study and the previous studies in determining an association between

socio-demographic variables and knowledge of CKD risk factors may be related to the smaller number of respondents in our survey. However, in spite of this limitation and in line with other major studies in this field (5,10,16) we suggest that future public health education programs be targeted more towards the elderly population and communities with lower socio-economic status.

In our survey, only 10.4% of the respondents knew that CKD symptoms may not manifest in its' initial stages. The majority of the respondents believed that "pain in the flanks" and "difficulty in urination" are the early symptoms of CKD. These findings may raise the notion that a considerable proportion of the Iranian population may not seek renal care counseling until symptoms arise. When the respondents were asked "how often do you counsel with your physician about your renal function?" the majority selected "more than every two years" and "Do not know/ no response". Our findings suggest that future public health education programs should put an effort into educating the Iranian community about the asymptomatic nature of CKD in the initial stages and highlighting the importance of regular renal care counseling. In recent years, several developed countries have launched national efforts to educate the public about the linkages between unmanaged diabetes/hypertension and CKD. These efforts are based mainly on the premise that individuals with appropriate knowledge and information are more likely to adhere to their medical treatments (11) and achieve the optimal blood sugar and blood pressure levels (12,13). As an example, in the United States, the National Kidney Foundation has organized the Kidney Early Evaluation Program (KEEP) that targets the individuals with diabetes and/or hypertension for educational programs and early CKD screening (22,23). The participants in KEEP are provided with the appropriate information regarding the association of hypertension/diabetes and CKD. The KEEP also encourages the participants to follow up with their clinicians for prevention and treatment of risk conditions. Participants are followed up by telephone and mail. Follow-up studies have demonstrated that this program has been successful in early identification of individuals with CKD, broadening the reach of pre-ESRD education efforts, and reducing ESRD mortality (24,25).

In Iran, in spite of the high incidence of CKD and its large economic burden (6,7), there has been no systematic attempt to improve the awareness of this disease, its risk factors, and consequences in the at-risk individuals. It should be noted that low-cost strategies are most likely to be achievable in Iran due to the limited healthcare resources. A CKD awareness program like KEEP can be a useful model in Iran for reducing the incidence of CKD among at-risk individuals (i.e. patients

with diabetes and hypertension). This involves several important steps, including: a) improving the communication between physicians and patients regarding the increased risk of developing CKD in patients with unmanaged diabetes/hypertension; b) encouraging the patients to adopt lifestyle modifications in order to achieve the optimal blood sugar and blood pressure levels; c) encouraging the patients to follow up with their clinicians for treatment of their risk factors and early CKD screening. These efforts should be at the primary care level with more emphasis paid to older patients with lower socio-economic status.

Conclusion

In conclusion, the general knowledge level of Iranian population about CKD and its risk factors is low. At-risk individuals (i.e. individuals with diabetes/hypertension) are not adequately informed regarding their increased risk for developing CKD. Future public awareness programs should be more targeted toward patients with CKD risk factors and communities with low socio-economic status. We hope that this study will contribute to Iran's efforts in improving its public healthcare education system.

Limitation

The main limitation of this study was the methodology used for sample selection and data gathering. The respondents who participated in this survey were volunteers whose purpose was to participate in a kidney diseases awareness campaign. This may suggest a possibility of selection bias as the respondents might be from a higher socio-economic status and had a higher level of education than the general Iranian population. In addition, the study did not include a question in the questionnaire as to whether or not the participating respondents with a CKD risk factor had a routine medical care or not. This omission should be considered in future surveys.

Acknowledgments

This work was supported by a grant from the Vice Chancellery for Research and Technology, Isfahan University of Medical Sciences, Isfahan, Iran.

Ethical issues

The study protocol was approved by the ethics committee of the Isfahan University of Medical Sciences.

Competing interests

The authors have no proprietary interest in the materials presented herein.

Authors' contributions

PR and DT were the main investigators, participated in the design and conducting the study, drafted and edited the manuscript. AA participated in the design of the study and conducted the statistical analysis. MM, ML, BM, SMM, FAH, and AP participated in the design and conducted the data gathering for the study. MN participated in the design of the study and edited the manuscript. All authors read and approved the final manuscript. DT is the study guarantors.

Authors' affiliations

¹Isfahan Kidney Diseases Research Center, Isfahan University of Medical Sciences, Isfahan, Iran. ²Medical Students Research Center, Isfahan University of Medical Sciences, Isfahan, Iran. ³Department of Pathology, Isfahan University of Medical Sciences, Isfahan, Iran. ⁴Department of Nephrology, Isfahan University of Medical Sciences, Isfahan, Iran. ⁵Endocrinology and Diabetes Division, Vali-Asr Hospital, Tehran University of Medical Sciences, Tehran, Iran.

References

1. Levey AS, Atkins R, Coresh J, Cohen EP, Collins AJ, Eckardt KU, *et al.* Chronic kidney disease as a global public health problem: approaches and initiatives - a position statement from Kidney Disease Improving Global Outcomes. *Kidney Int* 2007; 72: 247–59. doi: [10.1038/sj.ki.5002343](https://doi.org/10.1038/sj.ki.5002343)
2. Tonelli M, Wiebe N, Culleton B, House A, Rabbat C, Fok M, *et al.* Chronic kidney disease and mortality risk: a systematic review. *J Am Soc Nephrol* 2006; 17: 2034–47.
3. Levey AS, Astor BC, Stevens LA, Coresh J. Chronic kidney disease, diabetes, and hypertension: what's in a name? *Kidney Int* 2010; 78: 19–22. doi: [10.1038/ki.2010.115](https://doi.org/10.1038/ki.2010.115)
4. Levey AS, Coresh J. Chronic kidney disease. *Lancet* 2012; 379: 165–80. doi: [10.1016/s0140-6736\(11\)60178-5](https://doi.org/10.1016/s0140-6736(11)60178-5)
5. Plantinga LC, Tuot DS, Powe NR. Awareness of chronic kidney disease among patients and providers. *Adv Chronic Kidney Dis* 2010; 17: 225–36. doi: [10.1053/j.ackd.2010.03.002](https://doi.org/10.1053/j.ackd.2010.03.002)
6. Tohidi M, Hasheminia M, Mohebi R, Khalili D, Hosseini F, Yazdani B, *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. doi: [10.1371/journal.pone.0045304](https://doi.org/10.1371/journal.pone.0045304)
7. Nafar M, Mousavi SM, Mahdavi-Mazdeh M, Pour-Reza-Gholi F, Firoozan A, Einollahi B, *et al.* Burden of chronic kidney disease in Iran: a screening program is of essential need. *Iran J Kidney Dis* 2008; 2: 183–92.
8. Mahdavi-Mazdeh M. Why do we need chronic kidney disease screening and which way to go? *Iran J Kidney Dis* 2010; 4: 275–81.
9. Barsoum RS. Chronic kidney disease in the developing world. *N Engl J Med* 2006; 354: 997–9. doi: [10.1056/nejmp058318](https://doi.org/10.1056/nejmp058318)
10. Chow WL, Joshi VD, Tin AS, van der Erf S, Lim JF, Swah TS, *et al.* Limited knowledge of chronic kidney disease among primary care patients—a cross-sectional survey. *BMC Nephrol* 2012; 13: 54. doi: [10.1186/1471-2369-13-54](https://doi.org/10.1186/1471-2369-13-54)
11. Swartz MD, Robinson K, Davy T, Politoski G. The role of patients in the implementation of the National Kidney Foundation-Dialysis Outcomes Quality Initiative. *Adv Ren Replace Ther* 1999; 6: 52–8.
12. Lorig K, Ritter PL, Villa F, Piette JD. Spanish diabetes self-management with and without automated telephone reinforcement: two randomized trials. *Diabetes Care* 2008; 31: 408–14. doi: [10.2337/dc07-1313](https://doi.org/10.2337/dc07-1313)
13. Wright-Nunes JA, Luther JM, Ikizler TA, Cavanaugh KL. Patient knowledge of blood pressure target is associated with improved blood pressure control in chronic kidney disease. *Patient Educ Couns* 2012; 88: 184–8. doi: [10.1016/j.pec.2012.02.015](https://doi.org/10.1016/j.pec.2012.02.015)
14. Hemmelgarn BR, Zhang J, Manns BJ, James MT, Quinn RR, Ravani P, *et al.* Nephrology visits and health care resource use before and after reporting estimated glomerular filtration rate. *JAMA* 2010; 303: 1151–8. doi: [10.1001/jama.2010.303](https://doi.org/10.1001/jama.2010.303)
15. Events Map, World Kidney Day [internet]. [cited 2013 August 30]. Available from: <http://www.worldkidneyday.org/events/map?id=913>
16. Waterman AD, Browne T, Waterman BM, Gladstone EH, Hostetter T. Attitudes and behaviors of African Americans regarding early detection of kidney disease. *Am J Kidney Dis* 2008; 51: 554–62. doi: [10.1053/j.ajkd.2007.12.020](https://doi.org/10.1053/j.ajkd.2007.12.020)
17. White SL, Polkinghorne KR, Cass A, Shaw J, Atkins RC, Chadban SJ. Limited knowledge of kidney disease in a survey of AusDiab study participants. *Med J Aust* 2008; 188: 204–8.
18. Boulware LE, Carson KA, Troll MU, Powe NR, Cooper LA. Perceived susceptibility to chronic kidney disease among high-risk patients seen in primary care practices. *J Gen Intern Med* 2009; 24: 1123–9. doi: [10.1007/s11606-009-1086-6](https://doi.org/10.1007/s11606-009-1086-6)
19. Tan AU, Hoffman B, Rosas SE. Patient perception of risk factors associated with chronic kidney disease morbidity and mortality. *Ethn Dis* 2010; 20: 106–10.

20. Ayotte BJ, Trivedi R, Bosworth HB. Racial differences in hypertension knowledge: effects of differential item functioning. *Ethn Dis* 2009; 19: 23–7.
21. Fezeu L, Fointama E, Ngufor G, Mbeh G, Mbanya JC. Diabetes awareness in general population in Cameroon. *Diabetes Res Clin Pract* 2010; 90: 312–8. doi: [10.1016/j.diabres.2010.06.029](https://doi.org/10.1016/j.diabres.2010.06.029)
22. Ohmit SE, Flack JM, Peters RM, Brown WW, Grimm R. Longitudinal Study of the National Kidney Foundation's (NKF) Kidney Early Evaluation Program (KEEP). *J Am Soc Nephrol* 2003; 14: S117–21. doi: [10.1097/01.asn.0000070155.63971.b2](https://doi.org/10.1097/01.asn.0000070155.63971.b2)
23. Vassalotti JA, Li S, Chen SC, Collins AJ. Screening populations at increased risk of CKD: the Kidney Early Evaluation Program (KEEP) and the public health problem. *Am J Kidney Dis* 2009; 53: S107–14. doi: [10.1053/j.ajkd.2008.07.049](https://doi.org/10.1053/j.ajkd.2008.07.049)
24. Whaley-Connell AT, Vassalotti JA, Collins AJ, Chen SC, McCullough PA. National Kidney Foundation's Kidney Early Evaluation Program (KEEP) annual data report 2011: executive summary. *Am J Kidney Dis* 2012; 59: S1–4. doi: [10.1053/j.ajkd.2011.11.018](https://doi.org/10.1053/j.ajkd.2011.11.018)
25. Kurella Tamura M, Li S, Chen SC, Cavanaugh KL, Whaley-Connell AT, McCullough PA, et al. Educational programs improve the preparation for dialysis and survival of patients with chronic kidney disease. *Kidney Int* 2014; 85: 686–92. doi: [10.1038/ki.2013.369](https://doi.org/10.1038/ki.2013.369)

Key Messages

Implications for policy makers

- Improving the public's knowledge about CKD and its risk factors is an important strategy for the prevention of this disease.
- Future public awareness programs should be targeted toward patients with CKD risk factors and communities with low socio-economic status.
- CKD high-risk individuals should receive tailored education and information regarding their risk levels with this disease. Furthermore, they should be encouraged to adopt lifestyle modifications to prevent or slow the progression of CKD.
- The experience of the Kidney Early Evaluation Program (KEEP) could be a useful model for the Iranian health organization in reducing the incidence of CKD among high-risk groups.

Implications for public

In Iran, the incidence of Chronic Kidney Disease (CKD) is steadily increasing. The economic burden of this disease is a significant challenge for the healthcare system. Our findings suggested that the general Iranian population is not sufficiently informed regarding the role of diabetes/hypertension in the development of CKD. The at-risk individuals are not adequately informed of their increased risk for developing CKD. There is an imperative need to promote national public health education programs with particular attention paid to patients with diabetes and hypertension, which will aid in reducing the increasing costs to Iranian healthcare system