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Prevalence of chronic kidney disease in the Kidney Early Evaluation Program (KEEP) México and comparison with KEEP US

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The National Kidney Foundation Kidney Early Evaluation Program (KEEP) is a free community screening program aimed at early detection of kidney disease among high-risk individuals. A pilot phase of KEEP México began in 2008 in México City and Jalisco State. Adults with diabetes, hypertension, or family history of diabetes, hypertension, or chronic kidney disease (CKD) were invited to participate through advertising campaigns. All participants completed a questionnaire. Blood pressure, weight, and height were measured; blood and urine tests included albuminuria and serum creatinine to estimate glomerular filtration rate using the Modification of Diet in Renal Disease Study equation. Mean age of KEEP México City and KEEP Jalisco participants was 46 and 53 years, respectively; >70% were women. CKD prevalence was 22% in KEEP México City and 33% in KEEP Jalisco, not significantly different from reported KEEP US prevalence of 26%. CKD stages 1 and 2 were more frequent in KEEP México and stage 3 in KEEP US. In KEEP México City, CKD prevalence was higher than the overall prevalence among participants with diabetes (38%) or diabetes and hypertension (42%). Most KEEP México participants were unaware of the CKD diagnosis, despite that 71% in KEEP México City had seen a doctor in the previous year. CKD is highly prevalent, underdiagnosed, and underrecognized among high-risk individuals in México. KEEP is an effective screening program that can successfully be adapted for use in México.

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KEYWORDS: chronic kidney disease; Kidney Early Evaluation Program; prevalence

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The National Kidney Foundation Kidney Early Evaluation Program (KEEP) is a free kidney health screening program designed to raise awareness about kidney disease among high-risk individuals, and to provide free testing and educational information to help prevent or delay kidney disease and its complications. KEEP aims at early detection of kidney disease among individuals with diabetes mellitus, arterial hypertension, or a family history of diabetes, hypertension, or chronic kidney disease (CKD). KEEP began 9 years ago and, to date, more than 100,000 people have been screened for kidney disease in the United States.[1] The KEEP US methodology was adapted for use in México, and a pilot phase began in 2008 at two sites, México City and nearby states, and Jalisco State.

We present the results of the KEEP México pilot phase and compare them with results from KEEP US and with national health surveys from both countries.

RESULTS

Patient characteristics

In KEEP México City, 1519 individuals participated in 11 screening events between 1 September 2008 and 31 June 2009. In KEEP Jalisco, 2020 individuals participated in a continuous screening program between 1 July 2008 and 31 June 2009. KEEP México City participants were significantly younger than KEEP Jalisco and KEEP US participants (Table 1); KEEP Jalisco and KEEP US age groups did not differ significantly. Participants were predominantly women at each site. The educational level was lower in KEEP Jalisco than in KEEP México City or KEEP US. Compared with KEEP US, medical insurance coverage was significantly lower in KEEP Jalisco and no different in KEEP México City. All insured KEEP Jalisco participants had public medical insurance coverage; 88% of insured KEEP México City participants had public coverage and 12% private coverage. About 10% of KEEP México participants lived in rural areas. Higher proportions of KEEP Jalisco and KEEP US participants had diabetes or hypertension (90%, KEEP Jalisco; 83%,

Table 1 | Participants characteristics, KEEP México and KEEP US

Characteristics	KEEP site			*P*-value[a]	*P*-value[b]	*P*-value[c]
	México City	Jalisco	US			
n	1519	2020	89,622			
Sociodemographic						
Age, years, mean (s.d.)	46 (15)	53 (13)	ND	<0.0001[d]	—	—
Age groups				0.01	0.01	0.43
18–30	17	5	8			
31–45	35	23	22			
46–60	32	44	35			
61–75	14	24	27			
>75	3	4	9			
Women	72	74	68	0.87	0.64	0.44
Education				<0.0001	0.0002	<0.0001
Primary school	27[e]	64[e]	6			
High school	34	26	36			
More than high school	39	10	58			
Medical insurance	68	56	78	0.11	0.15	0.02
Setting				0.81	—	—
Rural	11	9	ND			
Urban	89	91	ND			
Inclusion criteria						
Diabetes	28	44	28	0.03	1.00	0.03
Hypertension	34	46	55	0.11	0.004	0.26
Diabetes/hypertension	14	17	ND	0.70	—	—
Family history[f]	52	23	ND	<0.0001	—	—
Other comorbid conditions						
Hypercholesterolemia	32[g]	50[h]	57[i]	0.01	0.001	0.40
Current smoking	20	20	39	1.00	0.01	0.005

Abbreviations: KEEP, Kidney Early Evaluation Program; ND, no data available.
Note: Values are percents unless otherwise indicated.
[a]By Pearson's χ^2-test or exact Fisher test (two-sided); México City versus Jalisco.
[b]By Pearson's χ^2-test or exact Fisher test (two-sided); México City versus US.
[c]By Pearson's χ^2-test or exact Fisher test (two-sided); Jalisco versus US.
[d]Obtained by *t*-test for independent variables.
[e]Includes participants with incomplete or no primary school.
[f]Family history of diabetes, hypertension, or chronic kidney disease.
[g]Self-reported high cholesterol.
[h]Measured cholesterol >200 mg/dl.
[i]Self-reported high cholesterol or measured cholesterol >200 mg/dl.

KEEP US), compared with KEEP México City participants (62%). For 52% of KEEP México City participants, family history of diabetes, hypertension, or CKD was the only screening program entry criteria that they met. Hypercholesterolemia prevalence was lower in KEEP México City than in KEEP Jalisco or KEEP US, and current smoking was less prevalent in KEEP México than in KEEP US.

KEEP and national health surveys

Prevalence of diabetes and hypertension was significantly higher in KEEP México and KEEP US compared with the prevalence reported in national health surveys, including México's Encuesta Nacional de Salud (ENSA) 2000[2] and the US National Health and Nutrition Examination Survey (NHANES) 1999–2006[3] (Table 2). Interestingly, prevalence of diabetes and hypertension, and of overweight and obesity, was similar in ENSA 2000 and NHANES 1999–2006. Prevalence of overweight (body mass index (BMI) 25–29.9 kg/m^2) and obesity (BMI $\geqslant$ 30 kg/m^2) was similar in KEEP México and KEEP US, and not different from the prevalence reported in the national health surveys ($P>0.05$ for all comparisons). The only exception was the higher prevalence of obesity in KEEP Jalisco compared with ENSA 2000 ($P=0.007$). Albuminuria (albumin-to-creatinine ratio (ACR) >30 mg/g) prevalence was significantly lower in KEEP México than in ENSA 2000 ($P=0.003$); the reverse was found for KEEP US and NHANES 1999–2006 ($P=0.22$). Prevalence of dipstick proteinuria in KEEP Jalisco was 31%, which was higher than the prevalence reported in ENSA 2000 for nondiabetic participants (27.3% for diabetic ($P=0.64$) and 10.5% for nondiabetic participants ($P=0.0008$)). Compared with KEEP US, prevalence of estimated glomerular filtration rate (eGFR) <60 ml/min per 1.73 m^2 was lower in KEEP México City and not significantly different in KEEP Jalisco ($P=0.61$).

Other abnormalities detected by KEEP

Other abnormalities detected by KEEP (Table 3) included prevalence of elevated glucose and blood pressure, of

Table 2 | Prevalence of risk factors in KEEP Mexico and KEEP US and in Mexican and US national health surveys

Risk factor	KEEP México City	KEEP Jalisco	ENSA 2000	KEEP US	NHANES 1999–2006	*P*-value[a]	*P*-value[b]	*P*-value[c]	*P*-value[d]
Diabetes[e]	29	48	8	29	7	0.009	1.00	0.009	1.00
Hypertension[e]	49	49	31	69	29	1.00	0.01	0.006	0.88
Overweight (BMI 25–29 kg/m^2)	37	36	38	32	34	1.00	0.55	0.65	0.66
Obesity (BMI $\geqslant$30 kg/m^2)	34	48	24	44	32	0.06	0.19	0.67	0.27
Albuminuria (ACR $>$30 mg/g)	19	31[f]	39	12	6	NA	0.24	NA	NA
eGFR $<$60 ml/min per 1.73 m^2	7	10	ND	18	9	0.61	0.03	0.15	ND

Abbreviations: ACR, albumin-to-creatinine ratio; BMI, body mass index; eGFR, estimated glomerular filtration rate; ENSA, Encuesta Nacional de Salud; KEEP, Kidney Early Evaluation Program; NA, not applicable; ND, no data available; NHANES, National Health and Nutrition Examination Survey.
Note: Values are percents unless otherwise indicated.
[a]By exact Fisher test (two-sided); México City versus Jalisco.
[b]By exact Fisher test (two-sided); México City versus US.
[c]By exact Fisher test (two-sided); Jalisco versus US.
[d]By exact Fisher test (two-sided); ENSA versus NHANES.
[e]Includes participates with known history of diabetes or hypertension and those detected by KEEP screening.
[f]Dipstick proteinuria.

Table 3 | Other abnormalities detected by KEEP México and KEEP US

Condition	KEEP Site: México City	Jalisco	US	*P*-value[a]	*P*-value[b]	*P*-value[c]
Elevated glucose	7	36	10	$<$0.0001	0.61	$<$0.0001
Elevated blood pressure	35	35	52	1.00	0.02	0.02
Glycemic control	90	27	90	$<$0.0001	1.00	$<$0.0001
Blood pressure control	30	10	52	0.0007	0.002	$<$0.0001
Anemia[d]	11	7	14	0.46	0.67	0.17

Abbreviation: KEEP, Kidney Early Evaluation Program.
Note: Values are percents unless otherwise indicated.
[a]By exact Fisher test (two-sided); México City versus Jalisco.
[b]By exact Fisher test (two-sided); México City versus US.
[c]By exact Fisher test (two-sided); Jalisco versus US.
[d]Kidney Disease Outcomes Quality Initiative definition.

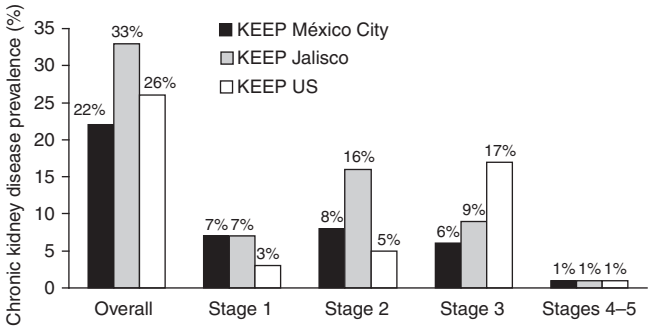

Figure 1 | Prevalence of chronic kidney disease and chronic kidney disease stages between KEEP México and KEEP US participants.

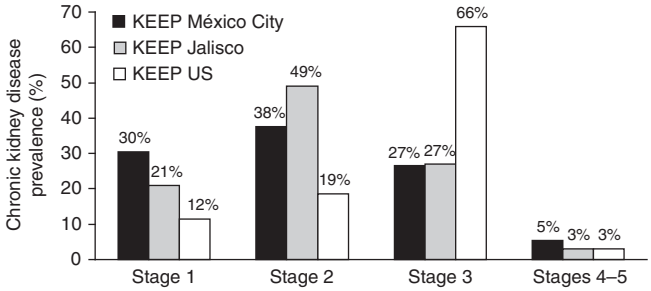

Figure 2 | Prevalence of chronic kidney disease stages between KEEP México and KEEP US participants with chronic kidney disease.

glycemic and blood pressure control, and of anemia as defined by the Kidney Disease Quality Outcomes Initiative (KDOQI).[4] It is noteworthy that prevalence of elevated glucose was significantly higher in KEEP Jalisco than in KEEP México City or KEEP US. Prevalence of elevated blood pressure was higher in KEEP US than in KEEP México. Glycemic and blood pressure control was significantly lower in KEEP Jalisco than in KEEP México City or KEEP US. Anemia prevalence did not differ at the three sites. Data from KEEP México City on calcium, phosphorus, and parathyroid hormone are not reported because of the small number of samples.

Prevalence of CKD

Prevalence of CKD and CKD stages among KEEP participants is shown in Figure 1. Overall, CKD prevalence tended to be higher in KEEP Jalisco than in KEEP México City or KEEP US, but the differences were not statistically significant ($P=0.21$). Prevalence of early CKD (stages 1 and 2) seemed to be higher in KEEP México than in KEEP US, but the difference was statistically significant only for stage 2 ($P=0.02$), and was driven by the difference in prevalence between KEEP Jalisco and KEEP US ($P=0.02$). Prevalence of CKD stage 3 was higher in KEEP US than in KEEP México ($P=0.03$), and was driven by the difference in prevalence between KEEP México City and KEEP US ($P=0.02$). Prevalence of CKD stages 4 and 5 did not differ significantly among the sites.

Prevalence of CKD stages among KEEP participants identified as having CKD is shown in Figure 2. Prevalence of CKD stages 1 and 2 was higher in KEEP México than in KEEP US ($P=0.005$ and <0.0001, respectively), with the difference driven by KEEP México City for stage 1

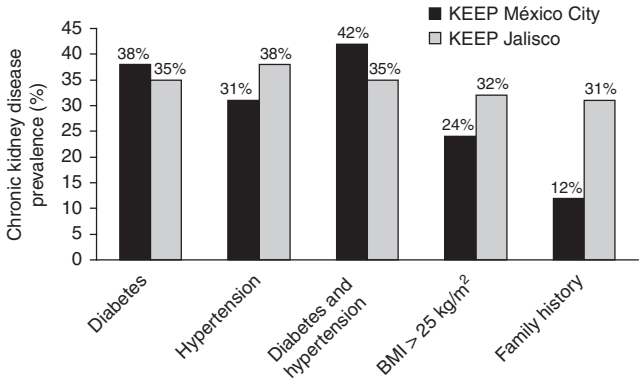

Figure 3 | Prevalence of chronic kidney disease among KEEP México City and KEEP Jalisco participants by risk factor. BMI, body mass index; family history, family history of diabetes, hypertension, or chronic kidney disease.

($P = 0.0009$) and by KEEP México City and KEEP Jalisco for stage 2 ($P = 0.005$ and < 0.001, respectively). Prevalence of CKD stage 3 was significantly higher in KEEP US than in KEEP México ($P < 0.0001$), and prevalence of CKD stages 4 and 5 did not differ significantly among the sites.

Compared with overall prevalence of CKD of 22% for KEEP México City, prevalence was significantly higher for participants with diabetes or with diabetes and hypertension ($P = 0.02$ and 0.004, respectively; Figure 3), but not significantly different for participants with hypertension ($P = 0.20$), BMI $> 25\,kg/m^2$ ($P = 0.087$), or family history of diabetes, hypertension, or CKD ($P = 0.09$). Compared with overall prevalence of CKD of 33% for KEEP Jalisco, prevalence did not differ significantly for participants with any of the risk factors, including family history of diabetes, hypertension, or CKD. Comparing prevalence of CKD by risk factor between KEEP México City and KEEP Jalisco showed no statistically significant differences, except for family history of diabetes, hypertension, or CKD ($P = 0.0003$).

In KEEP México City, only 1% of participants were aware of the CKD diagnosis, and none were aware in KEEP Jalisco. Moreover, 71% of KEEP México City participants had been seen by a doctor in the previous year.

DISCUSSION

KEEP México has been shown to be an effective CKD screening program for high-risk individuals, including those with diabetes, hypertension, and family history of diabetes, hypertension, or CKD. Overall, CKD prevalence was 22% in KEEP México City and 33% in KEEP Jalisco, not significantly different from the 26% prevalence reported by KEEP US.[1] Importantly, in KEEP México City, CKD prevalence by risk factor was even higher than the overall prevalence among diabetic and hypertensive participants; 38% of diabetic participants and 42% of participants with diabetes and hypertension had CKD. Moreover, only 1% of participants in KEEP México City were aware of the diagnosis, despite the fact that 71% had been seen by a doctor at least once in the previous year. None of the KEEP Jalisco participants were aware of the diagnosis. On an aggregate, these data strongly indicate that CKD is underdiagnosed and underrecognized among high-risk individuals in México.

Overall, CKD prevalence tended to be higher in KEEP Jalisco than in KEEP México City or KEEP US, but the differences were not statistically significant. This trend could be due to the significantly higher prevalence of diabetes and the poorer population with less access to health care. Interestingly, CKD stages 1 and 2 were more prevalent in KEEP México than in KEEP US, where stage 3 predominated. We speculate that the younger age of the KEEP México population could explain these findings. Prevalence of CKD stages 4 and 5 did not differ significantly among the three sites.

In KEEP México City, CKD prevalence in participants with risk factors of diabetes and diabetes and hypertension was significantly higher than the overall prevalence of 22%, but prevalence did not differ among participants with hypertension, BMI $> 25\,kg/m^2$, or family history of diabetes, hypertension, or CKD. In contrast, in KEEP Jalisco, CKD prevalence in participants with these risk factors was not significantly different from the overall prevalence of 33%, possibly reflecting differences in the characteristics of the patient populations served by KEEP.

Albuminuria prevalence was lower in KEEP México City than in ENSA 2000 (personal communication, Aida Jiménez, MD). This finding is striking because only individuals at high risk for CKD were included in KEEP México City, whereas ENSA 2000 participants were from the general population. Differences in the methodology used to measure albuminuria could explain this finding. In KEEP México City, albuminuria was measured by ACR, with microalbuminuria defined as ACR 30–300 mg/g and albuminuria as ACR > 300 mg/g. In ENSA 2000, microalbuminuria was defined as a negative result of the Multistix Combur 10 test and an albumin concentration $\geqslant 20$ mg/l by Micraltest, and proteinuria was defined as a protein concentration $\geqslant 300$ mg/l in the Multistix Combur 10 test, regardless of the Micraltest result. In KEEP US, Clinitek Microalbumin Reagent Strips and the Clinitek 50 Analyzer (Siemens Healthcare Diagnostics, Tarrytown, NY, USA) for urinalysis were used to obtain microalbumin and ACR results. Microalbuminuria was defined as positive, trace, or microalbuminuria value > 20 mg/l, and as ACR $\geqslant 30$ mg/g.[1] Microalbuminuria prevalence by the former definition was 45% and by the latter definition 11.7%. The 39% microalbuminuria prevalence reported by ENSA 2000 is close to the 45% reported by KEEP US using the first definition. In contrast, the 11.7% prevalence in KEEP US using the ACR definition is close to the 19% prevalence reported by KEEP México City. Thus, the difference in microalbuminuria prevalence between ENSA 2000 and KEEP México City may be related to the methodology used to measure microalbuminuria.

The finding of higher prevalence of elevated glucose and lower prevalence of glycemic and blood pressure control in

KEEP Jalisco than in KEEP México City or KEEP US may be explained by the characteristics of the KEEP Jalisco population. No significant differences were found in anemia prevalence among the three sites.

The results of this study must be viewed in light of the following limitations. First, some differences in the characteristics of the population and in the methodology used must be taken into account when examining comparisons between the two KEEP México sites, and between KEEP México and KEEP US. Second, the Modification of Diet in Renal Disease (MDRD) Study equation, used to estimate GFR, has not been validated in México. Third, KEEP México serum creatinine (SCr) measurements were obtained in laboratories that use nonstandardized methods. However, 117 samples from KEEP México City participants were sent to the central reference laboratory used by KEEP US (Quest Laboratories, Chicago, IL, USA) for SCr measurement; the correlation coefficient between SCr measured in the Mexican lab and in the US lab was 0.958 (0.95–1.0 is considered acceptable). Additional analyses demonstrated that only 4 of the 117 participants were misclassified, 3 as CKD stage 2 instead of 1, and 1 as CKD stage 3 instead of 0 (no CKD).

In conclusion, the pilot phase of KEEP México has demonstrated that it is an effective CKD screening program for high-risk individuals, and that CKD is severely underdiagnosed and underrecognized. The pilot phase also shows that KEEP can be successfully adapted for use in countries other than the United States.

MATERIALS AND METHODS

Patient population

KEEP México City was directed to urban communities in México City and Pachuca, Hidalgo, and to suburban and rural communities in México State. KEEP Jalisco was directed to poor rural and urban communities in Jalisco State. The populations were informed about KEEP through advertising campaigns that highlighted risk factors for kidney disease, including diabetes, hypertension, and family history of diabetes, hypertension, or CKD, and the potential benefits of early CKD detection. Information strategies varied from community to community, but typically involved advertisement through local parishes, government authorities, primary care clinics, business enterprises of different sizes, or the Mexican Kidney Foundation.

To be eligible for screening, adults (aged 18 years or older) had to have diabetes, hypertension, or family history of diabetes, hypertension, or CKD. Individuals with known history of CKD, long-term dialysis, or kidney transplant were excluded.

KEEP México City was approved by the Institutional Review Board (IRB) of the Universidad Panamericana School of Medicine; written informed consent was obtained from each participant. The mobile screening units used by KEEP Jalisco are part of an established screening program that began 10 years ago; approval for the addition of the CKD module was waived by the IRB.

Program logistics and methods

In KEEP México City, a coordinator and a registered nurse were responsible for program advertisement, site selection, equipment, and staff training under the supervision of a nephrologist. The staff typically included 2–3 physicians, 2–3 nurses, 2 lab technicians, and 15–18 medical students and lay volunteers. Once selected, sites were equipped with six stations for registration, informed consent, questionnaire completion, physical examination, laboratory testing, and physician consultation. Participants were given appointment times between 0900 and 1600 hours, and the screening process lasted about 40–45 min. A total of 100–150 participants were screened in a single day.

KEEP Jalisco used two mobile units from the Hospitales Civiles de Guadalajara Foundation as temporary screening stations. The mobile units are equipped with facilities for history taking, physical examination, and phlebotomy, and with laboratory equipment to perform on-site laboratory measurements. Once on-site, the mobile unit remained open to the public for screening between 0800 and 1400 hours, Monday through Friday. The staff for each mobile unit consisted of a nurse, a social worker, a physician, and a laboratory technician, with the support of medical residents and nursing and medical students receiving training in community medicine.

Data were collected from each participant using a standardized form, and included age; sex; education level; employment status; medical insurance coverage; tobacco use; personal and family history of diabetes, hypertension, or CKD; and past medical care. Height and weight were measured and BMI was calculated. Blood pressure was measured by trained personnel using manual sphygmomanometers after participants rested quietly for 5 min.

Blood and urine specimens were obtained from all participants. In KEEP México City, on-site capillary blood measurements included glucose and hemoglobin, obtained with Accu-check Performa equipment and strips (Roche Diagnostics Operations, Indianapolis, IN, USA) for glucose and Hemocue Hb 201 analyzer and micro-cuvettes (HemoCue AB, Ängellhom, Sweden) for hemoglobin. Glucose levels were considered to be fasting glucose levels if the participant had fasted for at least 8 h, and otherwise were considered as nonfasting. In addition, 8 ml of venous blood was drawn with disposable vacutainers into two yellow-top tubes, centrifuged at 3000–4000 r.p.m. for 10 min, and sent refrigerated to a central reference laboratory for measurement of SCr with a Vitros 950 Chemistry System (Johnson & Johnson's Ortho-Clinical Diagnostics, Rochester, NY, USA). For patients with stage 3 CKD, serum calcium and phosphorus were measured with a Vitros 950 Chemistry System (Johnson & Johnson's Ortho-Clinical Diagnostics) that uses Arsenazo-III dye for calcium and ammonium molybdate for phosphorus. Intact parathyroid hormone was measured by a chemiluminescent immunoassay with a DXi800 equipment and Access Intact parathyroid hormone reagent (Beckman Coulter, Fullerton, CA, USA). A random urine sample was also obtained for on-site measurement of microalbumin and ACR results using Clinitek Microalbumin Reagent Strips and the Clinitek Status analyzer (Siemens Healthcare Diagnostics).

In KEEP Jalisco, venous blood samples were drawn by vacutainer or by disposable 5 ml syringe in vacuum-sealed red-top tubes; clotted samples were then centrifuged at 2500 r.p.m. for 10 min and processed in the screening van using an Alcyon 300 equipment (Abbott Laboratories, Abbott Park, IL, USA). SCr, total cholesterol, serum triglycerides, and glucose were measured for all participants who had been fasting for at least 8 h before specimen collection. The Abbot Alcyon 300 uses alkaline picrate reaction to measure creatinine by spectrophotometry (500 ± 20 nm). The equipment was checked every day with controls to ensure it was within the quality range established by the manufacturer; otherwise it was calibrated

as indicated by the manufacturer. Participants provided urine specimens for dipstick urinalysis (Multistix 10 SG, Bayer de México, S.A. de C.V., México). Results of urinalysis were interpreted by trained, experienced personnel working in well-lit and appropriate working conditions.

Definitions

KEEP México City used the same definitions used in KEEP US.[1]

Albuminuria. Normal: <30 mg/g.
Microalbuminuria: 30–300 mg/g.
Albuminuria: >300 mg/g.

Anemia.[4] Men: hemoglobin <13.5 g/dl.
Women: hemoglobin <12 g/dl.

Blood pressure control.[5] JNC 7 standards: systolic <120 mm Hg, diastolic <80 mm Hg.

BMI groups. Underweight: BMI $\leqslant 18.5$ kg/m^2.
Normal weight: BMI 18.5–24.9 kg/m^2.
Overweight: BMI 25–29.9 kg/m^2.
Obese: BMI 30–39.9 kg/m^2.
Extremely obese: BMI $\geqslant 40$ kg/m^2.

CKD. Estimated GFR <60 ml/min per 1.73 m^2 or eGFR >60 ml/min per 1.73 m^2 and ACR $\geqslant 30$ mg/g. GFR was estimated using the nonisotope dilution mass spectrometry-traceable 4-variable MDRD Study equation for noncalibrated SCr values: GFR $= 186 \times (\mathrm{Scr})^{-1.154} \times (\mathrm{age})^{-0.203} \times (0.742$ women$) \times 1.210$ (African American (this factor was not considered)).

CKD stages. Stage 1: eGFR $\geqslant 90$ ml/min per 1.73 m^2 and ACR $\geqslant 30$ mg/g.
Stage 2: eGFR 60–89 ml/min per 1.73 m^2 and ACR $\geqslant 30$ mg/g.
Stage 3: eGFR 30–59 ml/min per 1.73 m^2.
Stage 4: eGFR 15–29 ml/min per 1.73 m^2.
Stage 5: eGFR <15 ml/min per 1.73 m^2.

Diabetes mellitus. History of diabetes, defined as self-reported diabetes or retinopathy;
Receiving medication for diabetes or insulin; or
Elevated blood sugar defined by glucose $\geqslant 126$ mg/dl fasting or $\geqslant 200$ mg/dl nonfasting.

Elevated blood sugar. Without known diabetes: fasting blood sugar $\geqslant 126$ mg/dl, nonfasting $\geqslant 200$ mg/dl.
With known diabetes: fasting blood sugar $\geqslant 130$ mg/dl, nonfasting $\geqslant 180$ mg/dl.

Elevated measured blood pressure. With diabetes or CKD: systolic $\geqslant 130$ mm Hg or diastolic $\geqslant 80$ mm Hg.
Without diabetes or CKD: systolic $\geqslant 140$ mm Hg or diastolic $\geqslant 90$ mm Hg.

Glycemic control. Without known diabetes: fasting blood sugar <126 mg/dl, nonfasting <200 mg/dl.
With known diabetes: fasting blood sugar $\geqslant 130$ mg/dl, nonfasting $\geqslant 180$ mg/dl.

High cholesterol. Self-reported high cholesterol.

Hypertension. Self-reported history of high blood pressure;
Receiving medication for high blood pressure; or
Elevated blood pressure defined by systolic blood pressure $\geqslant 130$ mm Hg or diastolic blood pressure $\geqslant 80$ mm Hg for persons with history of diabetes or CKD, or systolic blood pressure $\geqslant 140$ mm Hg or diastolic blood pressure $\geqslant 90$ mm Hg for persons without history of diabetes or CKD.

KEEP Jalisco used the same definitions, except for the following:

CKD. Serum creatinine was used to estimate GFR using the MDRD equation.[6]

CKD stages. Stage 1: eGFR $\geqslant 90$ ml/min per 1.73 m^2 and proteinuria $\geqslant 15$ mg/dl.
Stage 2: eGFR 60–89 ml/min per 1.73 m^2 and proteinuria $\geqslant 15$ mg/dl.
Stage 3: eGFR 30–59 ml/min per 1.73 m^2.
Stage 4: eGFR 15–29 ml/min per 1.73 m^2.
Stage 5: eGFR <15 ml/min per 1.73 m^2.

Proteinuria. $\geqslant 15$ mg/dl (by Multistix, which does not detect microalbuminuria).

Total cholesterol and fasting triglycerides. Classified according to published guidelines.[7]

Follow-up

At both sites, participants found to have hypertension, proteinuria, or reduced eGFR were informed of the findings. In KEEP México City, participants found to have abnormal kidney function or other abnormalities were advised to follow up with their primary care physicians, or were referred to a clinic if they had no primary care physician. Follow-up calls were made 3 months after the screenings to determine whether these participants had sought medical attention. In KEEP Jalisco, participants found to have hypertension or proteinuria were advised to follow up with their physicians or with the nephrology outpatient clinic at the Hospitales Civiles if they had no regular physician. Participants with reduced eGFR were invited to participate in a subsidized, evidence-based, protocol-driven prevention clinic (a joint initiative of the Hospitales Civiles and the University of Alberta, Canada), which delivers care aimed at preventing cardiovascular disease and progressive loss of kidney function.

Statistical analysis

Contingency tables were built to compare percentages among all KEEP sites (México City, Jalisco, USA), and for comparisons with national health surveys (ENSA 2000 and NHANES 1999–2006).[2,3] Two-sided exact Fisher's test and Pearson's χ^2 were used to test statistical significance. The two-sided *t*-test was used to compare means. In any analysis, participants with any missing value were excluded. Statistical analyses were performed with the Statistical Package for Social Sciences (SPSS/PC), version 14 (SPSS, Chicago, IL, USA).

DISCLOSURE

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