ELSEVIER

ORIGINAL ARTICLE

Identifying Undetected Cases of Chronic Kidney Disease in Mexico. Targeting High-risk Populations

Guillermo García-García,[a] Alfonso J. Gutiérrez-Padilla,[b] Jonathan Chávez-Iñiguez,[a] Héctor R. Pérez-Gómez,[c] Martha Mendoza-García,[b] Ma. del Mar González-De la Peña,[b] and Marcello Tonelli[d]

[a]Division of Nephrology, Civil Hospital of Guadalajara, University of Guadalajara Health Sciences Center, Guadalajara, Jalisco, Mexico
[b]Civil Hospital of Guadalajara Foundation, Guadalajara, Jalisco, Mexico
[c]General Direction, Civil Hospital of Guadalajara, Guadalajara, Jalisco, Mexico
[d]Department of Medicine, University of Alberta, Edmonton, Canada

Background and Aims. Chronic kidney disease (CKD) is a major public health problem in Mexico. Current guidelines recommend routine CKD testing in patients at increased risk for CKD. We undertook this study to examine the diagnostic yield of targeted screening (case-finding) for CKD in high-risk populations in rural and urban communities in Jalisco, Mexico.

Methods. In a cross-sectional study, we did laboratory tests searching for CKD and its risk factors and compared the characteristics of participants with those reported by the National Health and Nutrition Survey 2006 (NHNS). Individuals who were aware that they had CKD and those <18 years of age were excluded.

Results. There were 9,169 participants assessed: 28.7% were men and mean age was 55.6 ± 13.7 years. They were predominantly female (71.3 vs. 55.6%, $p = 0.0001$) and older (55.59 ± 0.1 vs. 42.5 ± 0.3 years, $p = 0.0001$) than the NHNS population. Self-reported diabetes (41.9 vs. 7.3%, $p = 0001$) and fasting blood sugar >126 mg/dl (56.1 vs. 14.4%, $p = 0.0001$) were more prevalent among the participants; self-reported hypertension (41.9 vs. 7.3%, $p = 0.0001$), systolic blood pressure ≥140 mm Hg or diastolic blood pressure ≥90 mm Hg (52.5 vs. 43.2%, $p = 0.0001$), and obesity (42.8. vs. 29.3%, $p = 0.0001$) were also more frequent among participants. There were 19.7% with proteinuria; CKD was more prevalent among the high risk participants in our study (31.3 vs. 8.0%, $p = 0.0001$) than in the general population.

Conclusions. CKD was detected frequently in high-risk Mexican populations. Trials of case-finding and intervention are feasible and warranted in Mexico. © 2013 IMSS. Published by Elsevier Inc.

Key Words: Chronic kidney disease, Diabetes, Hypertension, Proteinuria.

Introduction

Chronic noncommunicable diseases such as obesity, diabetes mellitus, hypertension, and chronic kidney disease

(CKD) have become a major public health problem in the Mexican population (1–3). Eight percent of the general population has CKD (4), and the incidence of ESRD has increased dramatically in parallel with these risk factors (5). Mortality on dialysis is strikingly high, with approximately half of the patients dying within 6 months of dialysis therapy initiation (6). ESRD is currently among the ten leading causes of death in the general population (7).

CKD is usually asymptomatic until its advanced stages. Many patients are detected only shortly before the onset of

end-stage kidney failure. In theory, early detection would allow more time for evaluation and treatment but there is no evidence that general population screening for CKD is effective or cost-effective. Current guidelines recommend routine CKD testing in patients at increased risk for CKD, termed "case-finding." Characteristics most commonly cited as increasing the risk of CKD include diabetes, hypertension, cardiovascular disease, a family history of CKD, and age >60 years. Restricting routine testing to these patients is likely to reduce false-positive results and enable more efficient use of valuable resources (8−10).

In 2006, our institutions entered into a partnership aimed at preventing kidney failure among the poor population of Jalisco. The objective of this collaboration is to reduce morbidity and mortality due to kidney failure by identifying CKD and its major risk factors among poor residents of the state of Jalisco. We have screened persons at risk for the presence of CKD using mobile units that travel to rural and urban communities. In this study we examine the diagnostic yield of case-finding for CKD in high-risk populations using these units.

Materials and Methods

Between September 2006 and December 2009, we used mobile units to assess for the presence of CKD in poor rural and urban communities in Jalisco. The mobile clinic usually remained at each location for 5 consecutive days. The units were equipped with facilities for history taking, physical examination, phlebotomy, and laboratory equipment to perform on-site laboratory measurements. Units were staffed by personnel that included one nurse, one social worker, one physician, and one laboratory technician, supported by individuals receiving training in community medicine (nursing or medical students and medical residents). Details of this program have been described elsewhere (2).

Briefly, data were collected prospectively by staff using a standardized form. All participants were >18 years old. Persons who were aware that they had kidney disease were not assessed; all others were eligible to participate. Participants provided blood specimens used to measure serum creatinine, hemoglobin, and total cholesterol; serum triglycerides and glucose were measured in those who had been fasting for at least 8 h before specimen collection. We did not attempt to calibrate serum creatinine assays against a reference standard assay. Participants also provided urine specimens for dipstick urinalysis. Trained experienced personnel working in well-lit and appropriate working conditions interpreted the results of urinalyses, which were considered to indicate proteinuria if they showed $\geq 1+$ protein. Hypertension was classified according to the Joint National Committee 7 scheme (11). Participants were classified as having diabetes mellitus if they provided a history of diabetes or had fasting blood glucose

>126 mg/dl. Serum creatinine was used to estimate glomerular filtration rate (eGFR) using the Modification of Diet in Renal Diseases study equation; participants were classified as having CKD based on K/DOQI guidelines (9). Participants' body mass index (BMI) was classified according to the current WHO scheme (12). Serum levels of total cholesterol and fasting triglycerides were classified according to published guidelines (13).

Results were compared with those of Mexico's National Health and Nutrition Survey (NHNS) 2006 (1). Statistical analyses were performed with SPSS software version 15. T-tests and χ^2 tests (as appropriate) were used to perform comparisons between groups. The institutional review boards at the Hospital Civil and the University of Alberta approved this study.

Results

Demographic and clinical characteristics of the 9,169 participants are shown in Table 1. Of these, 28.7% were men and the mean age was 55.6 ± 13.7 years. When compared to NHNS participants (Table 2), participants in the current study were predominantly female (71.3 vs. 55.6%, $p = 0.0001$) and older (55.6 ± 0.1 vs. 42.5 ± 0.3 years, $p = 0.0001$) than the general Mexican population. Self-reported diabetes (41.9 vs. 7.3%, $p = 0001$) and fasting blood sugar >126 mg/dL (56.1 vs. 14.4%, $p = 0.0001$) were more prevalent among the high-risk population; self-reported hypertension (41.9 vs. 7.3%,

Table 1. Demographics and clinical characteristics of study participants

	$n = 9,619$
Age (years)	55.59 ± 13.74
Female (%)	6.861 (71.3)
Self-reported diabetes (%)	4,027 (41.9)
Self-reported hypertension (%)	4,956 (51.6)
BMI (kg/m^2)	29.4 ± 5.4
25-29.9	3,589 (38.1)
>30	4,028 (42.8)
Systolic blood pressure (mm Hg)	140.6 ± 24.0
Diastolic blood pressure (mm Hg)	82.5 ± 16.6
Serum creatinine (mg/dL)	0.98 ± 0.79
eGFR (mL/min/1.73 m^2)	77.7 ± 25.7
Blood glucose (mg/dL)	143.6 ± 73.7
>126 mg/dL (%)	3769 (39.7)
Serum cholesterol (mg/dL)	209.3 ± 60
70−99	8 (0.1)
100−129	251 (2.7)
130−159	980 (10.7)
>160	7,925 (86.5)
Serum triglycerides (mg/dL)	184.6 ± 147.7
<150	4,524 (49.5)
150−199	1,883 (20.6)
200−499	2,466 (27.0)
>500	275 (3.0)
Proteinuria (%)	1,760 (19.7)

eGFR, estimated glomerular filtration rate.