Little is known about the prevalence of chronic kidney disease (CKD) among the homeless in Mexico. The role of substance abuse, alcoholism, and homelessness in CKD has not been properly evaluated. We screened 260 homeless individuals in the state of Jalisco, Mexico, for the presence of CKD and its risk factors, and compared their characteristics with those from a separate cohort of poor Jalisco residents and with a survey of the general Mexican population. CKD was more prevalent among the homeless than among the poor Jalisco population (22% vs. 15.8%, P = 0.0001); 16.5% had stage 3, 4.3% stage 4, and 1.2% stage 5. All were unaware of having CKD. Only 5.8% knew they had diabetes, but 19% had fasting blood sugar > 126 mg/dl; 3.5% knew they were hypertensive but 31% had systolic blood pressure ≥ 140 mm Hg or diastolic blood pressure ≥ 90 mm Hg. Alcoholism was less common than in the poor Jalisco population (23.5% vs. 32.3%, P = 0.002), but tobacco smoking (34.6% vs. 21.5%, P = 0.0001) and substance abuse (18% vs. 11.1%, P = 0.0001) were more prevalent among the homeless. Likewise, chronic viral infections such as HIV (4.5% vs. 0.3%, P = 0.0001) and HCV (7.7% vs. 1.4%, P = 0.0001) were also significantly higher among the homeless than in the general population. In conclusion, CKD and its risk factors are highly prevalent among the homeless individuals in Jalisco, Mexico. Lack of awareness of having diabetes and hypertension is highly common, as is substance abuse. Programs aiming to prevent CKD and its risk factors in Mexico should specifically target this high-risk population.

INTRODUCTION

Chronic kidney disease (CKD) is a major cause of morbidity and mortality in Mexico. It has been estimated that 8% of the Mexican population has an estimated glomerular filtration rate (eGFR) < 60/ml/min per 1.73 m². Data from the Mexican National Health Survey 2000 indicate that risk factors for CKD are disproportionally higher among the poor. The role of substance abuse, alcoholism, and homelessness in CKD and its risk factors has not been adequately evaluated. Poverty and homelessness are barriers to medical care. Additionally, homeless persons are more likely to use acute hospital-based care, less likely to be aware of their illnesses, and less likely to comply with prescribed medications and therapy. Many present with advanced CKD at the time of diagnosis.

Little is known about the prevalence of CKD and its risk factors in this population. Among 15,353 individuals identified with CKD stages 3–5 receiving regular ambulatory care in an urban community health-care network, an estimated 6% were homeless and 46% were unemployed, disabled, and/or receiving public assistance. Hypertension and diabetes affected 46% and 22% of individuals, respectively; the prevalence of alcoholism (8%), depression (16%), drug abuse (16%), and chronic viral diseases such as HCV (4%) and HIV (3%) were also notable. Since 1998, the Fundacion Hospitales Civiles de Guadalajara has used mobile units to provide health care for the poor in Jalisco, with emphasis on disease prevention and early detection. In partnership with the Jalisco Institute for Social Welfare (IJAS), a state welfare agency, we screened homeless individuals in urban Guadalajara for the presence of CKD and its risk factors.

METHODS

Since September 2006, staff from the Hospitales Civiles de Guadalajara have used mobile units to establish temporary CKD screening stations in poor rural and urban communities in Jalisco. In the present report participants were located at IJAS’ Unit of...
### Results

Results are shown in Table 1. Between 1 to 20 September 2006, 260 homeless individuals were screened; they were predominantly male (74% vs. 49.7%, \( P = 0.0001 \)) when compared to the general Mexican and poor Jalisco populations, respectively. They were younger (50.75 ± 17.93 vs. 57.4 ± 13.0 years, \( P = 0.0001 \)) than the high-risk population. Only 5.8% of homeless patients knew they had diabetes, but 19% had fasting blood sugar >126 mg/dl; 3.5% of homeless patients knew they were hypertensive but 31% had systolic blood pressure ≥140 mm Hg or diastolic blood pressure ≥90 mm Hg, similar to the general population but lower than the poor Jalisco population (31.0% vs. 62%, \( P = 0.0001 \)). The prevalence of obesity among homeless participants was lower than in the general and poor Jalisco populations (17.6% vs. 31% and 43%, respectively, \( P = 0.0001 \)).

CKD, as defined by eGFR <60 ml/min per 1.73 m², was more prevalent among the homeless than in the poor Jalisco population (22.4% vs. 15.8%, \( P = 0.0001 \)); 16.5% had stage 3, 4.3% stage 4, and 1.2% stage 5 CKD. Homeless individuals with CKD were older (60.79 ± 14.86 vs. 47.57 ± 17.62 years, \( P = 0.0001 \)) and more diabetic (18.1 vs. 16.2, \( P = 0.03 \)) than those without CKD. Obesity (23.4% vs. 16.0%, \( P = 0.27 \)) and hypertension (34.5% vs. 30.3%, \( P = 0.62 \)) were more prevalent in persons with CKD, but these differences were not statistically significant. Unfortunately, results of urinalysis were not reported because the majority (95%) of individuals refused to submit a urine sample, arguing the risk of being tested for drugs. All of the homeless participants were unaware of having CKD.

Addictions were more prevalent among the homeless than in the general population (75.3% vs. 55.1%, \( P = 0.0001 \)) (Table 2). Homeless persons showed a lower prevalence of alcoholism (23.5% vs. 32.3%, \( P = 0.002 \)) than the general

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### Table 1 | Demographics and clinical characteristics of study participants

|                      | Homeless (n=260) | MNHSN 2006 (ref. 13) n=33,624 | Homeless versus MNHSN 2006 (P-value) | Jalisco\(^7\) (n=3734) | Homeless versus Jalisco (P-value) |
|----------------------|-----------------|------------------------------|-------------------------------------|-------------------------|----------------------------------|
| Age (years)          | 50.75 ± 17.93   | N/A                          | 57.4 ± 13.0                         | 0.0001                  |                                  |
| Male gender (%)      | 193 (74.2)      | 16,139 (49.7)                | 0.001                               | 1094 (29.3)             | 0.001                            |
| Known DM (%)         | 15 (5.8)        | 2554 (7.0)                   | 0.29                                | 1625 (43.5)             | 0.0001                           |
| Blood glucose (mg/dl)| 113.3 ± 46.9    | N/A                          | 145.6 ± 75.0                        | 0.0001                  |                                  |
| > 26 mg/dl (%)       | 48 (18.9)       | N/A                          | 1527 (41.7)                         | 0.001                   |                                  |
| Known hypertension (%)| 9 (3.5)        | 5044 (15.0)                  | 0.0001                              | 2217 (59.2)             | 0.0001                           |
| SBP ≥140 mm Hg or DBP ≥90 mm Hg (%) | 76 (31)        | 10,423 (30.8)                | 0.65                               | 2315 (62.0)             | 0.0001                           |
| Mean eGFR (ml/min per 1.73 m²) | 76.7 ± 25.1 | N/A                          | 78.3 ± 22.4                         | 0.006                   |                                  |
| eGFR 2 (%)           | 57 (22.4)       | N/A                          | 589 (15.8)                          | 0.05                    |                                  |
| BMI (kg/m²)          |                 |                              |                                     |                         |                                  |
| 25–29.9              | 59 (26.7)       | 13,380 (39.7)                | 0.0001                              | 1455 (39.8)             | 0.0001                           |
| ≥30                  | 39 (17.6)       | 10,444 (31.1)                | 0.0001                              | 1530 (41.9)             | 0.0001                           |

Abbreviations: BMI, body mass index; DBP, diastolic blood pressure; DM, diabetes mellitus; eGFR, estimated glomerular filtration rate; MNHSN, Mexican National Health Survey and Nutrition.
The prevalence of addictions and HVC was similar higher among the homeless than in the general population. Likewise, chronic viral infections such as HIV (4.5% vs. 0.3%), viral infections such as HCV (7.7% vs. 1.4%), were more prevalent among the homeless. Obesity are highly prevalent in the Mexican population. The prevalence of addictions and HVC was similar in individuals with and without CKD.

### DISCUSSION

CKD is a major public health problem in Mexico. It is estimated that 8% of the adult Mexican population has eGFR <60 ml/min per 1.73 m² (ref. 1) and that the prevalence is as high as 15.8% among high-risk, poor populations.7 Risk factors for CKD such as diabetes, hypertension, and obesity are highly prevalent in the Mexican population.2,13 Our results show a higher prevalence of CKD (22%) among the homeless compared with the report by Amato et al (8%),1 and our own data in poor urban and rural Jalisco populations (15.8%).7

Since the prevalence of traditional CKD risk factors like diabetes and hypertension among the homeless was lower than among the urban and rural poor populations, additional factors could explain this difference. First, the higher prevalence of chronic viral infections16,17 and substance abuse18,19 among the homeless could have played a role in the development of chronic glomerular disease; however, the lack of urine samples to test for protein and sediment did not allow us to assess this possibility. Second, as homeless individuals have limited access to health care, the presence of CKD risk factors may go unnoticed, increasing the risk of developing CKD. Also, homeless persons are less likely to be aware of their illnesses, and to comply with prescribed medications and therapy. As shown in our study, the majority of people with documented diabetes and hypertension were unaware of these conditions, and none had health insurance. Finally, homeless patients are more likely to present late in the course of CKD,5 which might lead to more rapid loss of kidney function. As shown in our study, 14 (5.5%) of the screened individuals had CKD stages 4 and 5 and had not ever seen a nephrologist.

Our study has several limitations that should be considered. Although data were collected prospectively, they may not be generalizable to all homeless settings in other regions of Mexico. Second, participants who agreed to participate in screening delivered by the mobile clinic may not be representative of those who would participate in other types of screening programs. Therefore, our results cannot be used to draw conclusions about the overall prevalence of CKD in homeless individuals in Mexico. Third, although the refusal to provide urine samples did not allow us to test for protein and hematuria, our results suggest that screening using mobile units in the population studied leads to a relatively high detection rate for reduced eGFR. Fourth, the MDRD Study equation has not been validated specifically in an unselected Mexican population; therefore, some participants may have been misclassified with respect to the presence or absence of eGFR ≤ 60 ml/min per 1.73 m². Finally, there is no information on the number of homeless people in Mexico. In Guadalajara, Jalisco’s state capital, the number of homeless individuals has been estimated to be around 600.20 Since 1980, the state government has been providing shelter and medical care to this population through the IJAS’s Unit of Assistance to the Homeless. Our results indicate that more efforts need to be directed to assess the burden of CKD in this setting.

In summary, CKD and its risk factors are highly prevalent among homeless persons in Jalisco, Mexico. Lack of awareness of having diabetes and hypertension is highly common in this population, as is the prevalence of chronic viral infections and substance abuse. Consideration should be given to target this high-risk population in programs aimed to prevent CKD and its risk factors in Mexico.

### DISCLOSURE

All the authors declared no competing interests.

### ACKNOWLEDGMENTS

Financial support for this study was provided by the Fundacion Hospitales Civiles de Guadalajara and the OPD Hospitales Civiles de Guadalajara. Publication of this article was supported in part by the National Health and Medical Research Council of Australia through an Australia Fellowship Award (#511081: theme Chronic Disease in High Risk Populations) to Dr Wendy Hoy, School of Medicine, the University of Queensland, and the National Institutes of Health—NIDDK DK079709, NCRR RR026138, and NIMHD MD000182.

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