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Chronic kidney disease in homeless persons in Mexico

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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 $\geqslant 140$ mm Hg or diastolic blood pressure $\geqslant 90$ 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. 1.1%, $P = 0.0001$) 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.

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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 m^2.[1] Data from the Mexican National Health Survey 2000 indicate that risk factors for CKD are disproportionally higher among the poor.[2]

Homeless persons face numerous barriers to receipt of appropriate health care. They present high rates of physical and mental illness, substance abuse, and early mortality.[3] 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.[3,4] Many present with advanced CKD at the time of diagnosis.[5]

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.[6]

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

Assistance for the Homeless and three other locations in the Jalisco state capital, Guadalajara. The mobile clinic remained on each location for 5 consecutive days. The mobile unit included facilities for history taking, physical examination, phlebotomy, and laboratory equipment to perform on-site laboratory measurements. It was staffed by personnel that included one nurse, one social worker, one physician, and one laboratory technician, with the support of individuals receiving training in community medicine (nursing or medical students and medical residents). Details of our screening program have been described elsewhere.[7] Briefly, data were collected prospectively by the staff of the screening programs using a standardized form. All participants were >18 years old. Persons who were aware that they had 'kidney disease' were not screened; all others were eligible to participate. Participants provided blood specimens used to measure serum creatinine 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 $\geqslant 1+$ protein. Hypertension was classified according to the Joint National Committee 7 scheme.[8] Participants were classified as having diabetes mellitus if they gave a history of diabetes, or had fasting blood glucose >126 mg/dl. Serum creatinine was used to determine the eGFR using the Modification of Diet in Renal Diseases study equation; participants were classified as having CKD based on the presence or absence of eGFR <60 ml/min per 1.73 m^2.[2,9] Participants' body mass index was classified according to the current WHO scheme.[10]

Homeless was defined as a person who has no income of his or her own to satisfy basic needs, and who does not have a place to live.[11] Alcohol and tobacco consumption, as well as substance abuse, was defined as their use at any time during the previous 12 months.[12] Findings were compared with those reported by the Mexican National Health Survey and Nutrition (MNHSN) 2006[13] and by the Mexican National Survey on Addictions (MNSA) 2002[12] for the general population, and with our own reported data on CKD in poor communities in Jalisco, Mexico.[7] T-tests and chi-squared tests (as appropriate) were used to perform comparisons between groups. The institutional review boards of the Hospital Civil de Guadalajara and the University of Alberta approved this study.

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% vs. 29%, $P=0.0001$) 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 $\geqslant$140 mm Hg or diastolic blood pressure $\geqslant$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 m^2, 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, $P=0001$) 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 are 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

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)	0.0001
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)			1527 (41.7)	0.0001
Known hypertension (%)	9 (3.5)	5044 (15.0)	0.0001	2217 (59.2)	0.0001
SBP $\geqslant$140 mm Hg or DBP $\geqslant$90 mm Hg (%)	76 (31)	10,423 (30.8)	0.65	2315 (62.0)	0.0001
Mean eGFR (ml/min per 1.73 m^2)	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/m^2)					
25–29.9	59 (26.7)	13,380 (39.7)	0.0001	1455 (39.8)	0.0001
$\geqslant$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.

Table 2 | Prevalence of substance abuse

	Homeless (*n*=260)	MNSA 2002 (ref. 12) (*N*=11,252)	Homeless versus MNSA 2002 (*P*-value)
Addictions	196 (75.3)	55.1	0.0001
Alcohol	61 (23.5)	32.3	0.0001
Tobacco	90 (34.6)	21.5	0.0001
Marijuana	17 (6.5)	0.6	0.0001
Inhalants	10 (3.8)	0.08	0.0001
Cocaine	7 (2.7)	0.35	0.0001
IV drugs	11 (4.2)	0.01	0.0001
Crack	2 (0.8)	0.04	0.0001

Abbreviation: MNSA, Mexican National Survey on Addictions.

population, but tobacco smoking (34.6% vs. 21.5%, $P = 0.0001$) and substance abuse (18% vs. 1.1%, $P = 0.0001$) 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.[14,15] 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 m^2 (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 infections[16,17] and substance abuse[18,19] 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 $\leqslant 60$ ml/min per 1.73 m^2. 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.

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REFERENCES

1. Amato D, Alvarez-Aguilar C, Castañeda-Limones R *et al.* Prevalence of chronic kidney disease in an urban Mexican population. *Kidney Int* 2005; **68**(Suppl 97): 11–17.
2. Olaiz G, Rojas R, Barquera S *et al. Encuesta Nacional de Salud 2000. Tomo 2. La salud de los adultos*. Instituto Nacional de Salud Pública: Cuernavaca, Morelos, México, 2003.
3. Kushel MB, Vittinghoff E, Hasas JS. Factors associated with the health care utilization of homeless persons. *JAMA* 2001; **285**: 200–206.
4. Fischer PJ, Shapiro S, Breakey WR *et al.* Mental health and social characteristics of the homeless. *Am J Public Health* 1986; **76**: 519–524.
5. Obialo CI, Ofili EO, Quarshie A *et al.* Ultra late referral and presentation for renal replacement therapy: socioeconomic implications. *Am J Kidney Dis* 2005; **46**: 881–886.
6. Hall YN, Choi AI, Chertow GM *et al.* Chronic kidney disease in the urban poor. *Clin J Am Soc Nephrol* 2010; **5**: 828–835.

7. Gutierrez-Padilla JA, Mendoza-Garcia M, Plascencia-Perez S *et al.* Screening for CKD and cardiovascular disease risk factors using mobile clinics in Jalisco, Mexico. *Am J Kidney Dis* 2010; **55**: 474–484.
8. Chobanian AV, Bakris GL, Black HR *et al.* The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure: the JNC 7 report. *JAMA* 2003; **289**: 2560–2571.
9. National Kidney Foundation. K/DOQI Clinical Practice Guidelines for Chronic Kidney Disease. *Am J Kidney Dis* 2002; **39**(Suppl 1): S76–S110.
10. World Health Organization. *Obesity: Preventing and Managing the Global Epidemic*. Technical Report Series No. 894. WHO: Geneva, Switzerland, 2000.
11. Instituto Nacional de Proteccion al Consumidor (INPC). http://elinpc.com.mx/indigencia-en-mexico, (accessed 16 April 2012).
12. Encuesta Nacional de Adicciones 2002. http://www.salud.gob.mx/unidades/cdi/documentos/DOCSAL7326.pdf (accessed 18 February 2012).
13. Olaiz-Fernandez E, Rivera-Dommarco J, Shamah-Levy T *et al. Encuesta Nacional de Salud y Nutricion 2006*. Instituto Nacional de Salud Publica: Cuernavaca, Mexico, 2006.
14. Valdespino JL, García-García ML, Conde-González CJ *et al.* Prevalence of HIV infection among adult population in Mexico: an increasingly expanding epidemic. *Salud Publica Mex* 2007; **49**(Suppl 3): S386–S394.
15. Valdespino JL, Conde-González CJ, Olaiz-Fernández G *et al.* Seroprevalence of hepatitis C among Mexican adults: an emerging public health problem? *Salud Publica Mex* 2007; **49**(Suppl 3): S395–S403.
16. D'Agati V, Appel GB. HIV infection and the kidney. *J Am Soc Nephrol* 1998; **8**: 138–152.
17. Johnson RJ, Willson R, Yamabe H *et al.* Renal manifestations of hepatitis C virus infection. *Kidney Int* 1994; **46**: 1255–1263.
18. Nzerue CM, Hewan-Lowe K, Riley LJ. Cocaine and the kidney: a synthesis of pathophysiologic and clinical perspectives. *Am J Kidney Dis* 2000; **35**: 783–795.
19. Jaffe JA, Kimmel PL. Chronic nephropathies of cocaine and heroin abuse: a critical review. *Clin J Am Soc Nephrol* 2006; **1**: 655–667.
20. La Jornada Aumenta entre 15% y 20% la indigencia en Guadalajara: UAPI. http://archivo.lajornadajalisco.com.mx/2007/03/04/index.php?section=sociedad&article=007n2soc. (accessed 1 April 2012).