AJKD
Original Investigation

The Prevalence of CKD in Rural Canadian Indigenous Peoples: Results From the First Nations Community Based Screening to Improve Kidney Health and Prevent Dialysis (FINISHED) Screen, Triage, and Treat Program

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Background: Indigenous Canadians have high rates of risk factors for chronic kidney disease (CKD), in particular diabetes. Furthermore, they have increased rates of complications associated with CKD, such as kidney failure and vascular disease. Our objective was to describe the prevalence of CKD in this population.

Study Design: Cross-sectional cohort.

Setting & Participants: Indigenous (First Nations) Canadians 18 years or older screened as part of the First Nations Community Based Screening to Improve Kidney Health and Prevent Dialysis (FINISHED) project, an initiative completed in 2015 that accomplished community-wide screening in 11 rural communities in Manitoba, Canada.

Predictors: Indigenous ethnicity and geographic location (communities accessible by road compared with those accessible only by air).

Outcome: Prevalence of CKD, presumed based on a single ascertainment of urine albumin-creatinine ratio (UACR) $\geq$ 30 mg/g and/or estimated glomerular filtration rate (eGFR) $<$ 60 mL/min/1.73 m^2.

Measurements: Kidney function measured by eGFR (CKD-EPI creatinine equation) and UACR.

Results: 1,346 adults were screened; 25.5% had CKD, defined as UACR $\geq$ 30 mg/g or eGFR $<$ 60 mL/min/1.73 m^2. Communities accessible by road had a lower prevalence of CKD (17.6%) than more remote communities accessible only by air (34.4%). Of those screened, 3.3% had reduced kidney function (defined as eGFR $<$ 60 mL/min/1.73 m^2). Severely increased albuminuria was present in 5.0% of those screened.

Limitations: Presumption of chronicity based on a single ascertainment. There is a possibility of sampling bias, the net direction of which is uncertain.

Conclusions: We found a 2-fold higher prevalence of CKD in indigenous Canadians in comparison to the general population and a prevalence of severely increased albuminuria that was 5-fold higher. This is comparable to patients with diabetes and/or hypertension. Public health strategies to screen, triage, and treat all Canadian indigenous peoples with CKD should be considered.

Am J Kidney Dis. 68(4):582-590.

INDEX WORDS: Screening; First Nations; indigenous community; Canada; chronic kidney disease (CKD); renal impairment; estimated glomerular filtration rate (eGFR); albuminuria; urine albumin-creatinine ratio (UACR); rural; remote; health care access; health disparities; early detection.

Chronic kidney disease (CKD) is a global health problem affecting 10% to 15% of the general population.[1] It is a potent risk factor for kidney failure, cardiovascular events, and early death.[2] These downstream outcomes are harmful for patients and costly for health systems.[3] Early detection and treatment of CKD using quantified spot proteinuria testing (urine albumin-creatinine ratio [UACR]), serum creatinine–based estimated glomerular filtration rate (eGFR), or both could decrease downstream harms and costs, but these benefits must be balanced against the harms and costs of the screening itself.[4] Most studies in primarily European and European American cohorts have concluded that population-based screening for CKD would not be cost-effective because of the low prevalence of CKD and the low probability of progression to kidney failure.[5] Current guidelines therefore recommend CKD screening only in high-risk subgroups, such as those with hypertension or diabetes.[6] It is unclear whether these recommendations can be generalized to other populations or racial and ethnic groups that have a higher prevalence of CKD or more rapid trajectory of progression.

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Received December 9, 2015. Accepted in revised form April 10, 2016. Originally published online May 31, 2016.

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0272-6386
http://dx.doi.org/10.1053/j.ajkd.2016.04.014

Canadian indigenous peoples are known to have a higher prevalence of major risk factors for CKD, such as diabetes and metabolic syndrome, and have increased rates of immune-mediated kidney diseases.[7] Furthermore, rates of complications associated with CKD, such as kidney failure and vascular disease, are higher among Canadian indigenous peoples.[8] The number of rural indigenous patients with kidney failure requiring dialysis has increased disproportionately in Canada over the last 25 years.[9] Although kidney failure rates are known to be much higher in this population, the true burden of non−dialysis-dependent CKD in indigenous communities remains undefined, with many affected individuals unaware of any underlying decreased kidney function.[10] This knowledge gap is attributable in part to reduced access to primary and specialty health care services, especially in rural communities.[11,12] These systemic barriers result in fewer opportunities for early detection of CKD in the primary health care setting and render prevalence estimates derived from administrative data sources unreliable.[13] An accurate description of the epidemiology of CKD in Canadian indigenous populations is a critical first step in the determination of the most cost-effective screening and treatment interventions in this population. These data would allow health systems to better realign CKD resources with clinical need and apply these strategies to other vulnerable populations at disproportionate risk.[14]

In order to address these important knowledge gaps, we analyzed cross-sectional data from the First Nations Community Based Screening to Improve Kidney Health and Prevent Dialysis (FINISHED) project, a 3-year, indigenous-led, 1-time screening, risk prediction and treatment initiative completed in April 2015. The primary objective of FINISHED was to provide mobile community-wide targeted screening for CKD, individualized kidney failure risk prediction, and risk-based counseling to all indigenous (First Nations) people 10 years and older residing in 11 representative Canadian rural communities across 2 Tribal Councils in Manitoba, Canada.[15] The current report summarizes the epidemiology of non−dialysis-requiring CKD among adult (aged ≥ 18 years) participants of FINISHED. Our analysis addressed 2 a priori hypotheses: first, rurally located indigenous adults would have higher rates of CKD than the general population, and second, remote communities accessible only by air would have higher rates of CKD than communities accessible by road, attributable to their reduced access to primary and specialty care.

METHODS

Approval and Consent

This project received approval from the Health Research Ethics Board at the University of Manitoba (HS16070) in addition to approvals from the Diabetes Integration Project Board of Directors, Tribal Council leaders, and the local governments of each community involved in the project. Ownership, Control, Access and Possession (OCAP) principles for indigenous research were strictly adhered to throughout this project. Patients provided informed consent to the use of screening data prior to point-of-care screening.

The FINISHED Screening Program

Methods of this screening program have been previously described, including a detailed overview of laboratory and clinical measurements.[15] In brief, the project was executed by an interdisciplinary team consisting of clinician scientists from the indigenous-led Diabetes Integration Project and the Manitoba Renal Program, the sole provider of kidney health care in Manitoba, Canada (population, ∼1.3 million). Extensive stakeholder consultation was obtained from various levels of government, community elders, federal and provincial health care payers, and regional health authority care providers.

Culturally safe protocols and standard operating procedures were developed to screen community members using point-of-care testing equipment deployed by mobile screening teams. The teams were indigenous led and trained in culturally safe practices. Risk for kidney failure was estimated in real time at the point of care, using a custom tablet–based app that incorporated the validated kidney failure risk equation, as well as other risk parameters for which the equation was not applicable (ie, eGFR > 60 mL/min/1.73 m^2; Fig S1, available as online supplementary material).[15,16]

Study Participation

Screening teams set up mobile clinics at nursing stations, community centers, and schools throughout chosen communities. All members of the community (aged ≥ 10 years) were invited to participate in the screening program regardless of comorbid predisposing risk factors for diabetes, hypertension, or CKD.

Data Collection and Study Definitions

As part of the screening process, the following data elements were obtained and entered into an electronic study database: demographic information, including age, sex, and community of residence; clinical data, including height, weight, body mass index, blood pressure, and laboratory values (serum creatinine, eGFR, UACR, and glycated hemoglobin [HbA_{1c}]). Serum creatinine was measured using the Piccolo Xpress (Abaxis) with daily quality assurance performed by Canadian External Quality Assurance Laboratories to ensure isotope-dilution mass spectrometry traceability.[17] UACR and HbA_{1c} were analyzed using the DCA Vantage Analyzer (Siemens). A mean of 6 blood pressure measurements were performed according to practices outlined by the Canadian Hypertension Education Program (CHEP) using the BPTru Medical Device (Coquitlam).[15]

eGFR was calculated using the CKD-EPI (CKD Epidemiology Collaboration) creatinine equation.[18] We defined CKD as a single measurement of UACR ≥ 30 mg/g and/or eGFR < 60 mL/min/1.73 m^2.[19] The cutoff for elevated blood pressure was taken as systolic blood pressure ≥ 140 mm Hg or diastolic blood pressure ≥ 90 mm Hg. Diabetes was defined for the purposes of this study as HbA_{1c} level ≥ 6.5%. Moderately increased albuminuria was defined as UACR of 30 to <300 mg/g, and severely increased albuminuria, as UACR ≥ 300 mg/g.[19]

Data Analysis

Aggregate descriptive statistics on screening results were compiled on variables describing the prevalence and severity of CKD. Summary statistics were expressed as mean ± standard deviation for normally distributed continuous variables, median and interquartile range for non-normally distributed variables, and percentage for categorical variables. Comparative statistical testing