Research note

Prevalence of self-reported chronic kidney disease in adults in the Metropolitan Region of Manaus: a cross-sectional population-based study, 2015*

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Abstract

Objective: to estimate the prevalence of self-reported chronic kidney disease and associated factors in adults living in the Metropolitan Region of Manaus, Brazil. **Methods:** this was a population-based cross-sectional study conducted in 2015, with probabilistic sampling to select adults ≥18 years to be interviewed at home; factors associated with self-reported chronic kidney disease were investigated using hierarchical Poisson regression, to calculate prevalence ratios (PR) and 95% confidence intervals (95%CI), considering the complex sampling used. **Results:** a total of 4,001 people were interviewed – 52.8% were women, 72.2% were of brown skin color and 19.7% had hypertension; prevalence of self-reported chronic kidney disease was 2.1% (95%CI 1.6;2.5), it was positively associated with age (35-44 years old, PR=2.31, 95%CI 1.02;5.21; 45-59 years old, PR=2.52, 95%CI 1.10;5.75; ≥60 years old, PR=2.95, 95%CI 1.21;7.16) and having had strokes (PR=2.20, 95%CI 1.09;4.45). **Conclusion:** two out of every 100 Manaus metropolitan region inhabitants self-reported chronic kidney disease and it was more frequent in older adults and those who had had strokes.

Keywords: Renal Insufficiency, Chronic; Adult; Self-Report; Prevalence; Population; Cross-Sectional Studies.

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Introduction

Chronic kidney disease is spread worldwide and is estimated to be prevalent in up to 15% of the population, principally in low and middle-income countries.[1,2] Early diagnosis of the disease is fundamental for therapeutic strategies to be effective in order to (i) prevent or delay its progression and (ii) for patients to begin renal replacement therapy – kidney dialysis or transplant.[3] A systematic review of Brazilian studies published as at 2017, estimated that 3 out of every 100 Brazilians have the disease and that 5 out of every 10,000 are undergoing some form of dialysis.[4]

The main causes of chronic kidney disease are arterial hypertension and diabetes mellitus, which predispose people who have these diseases to vascular complications, such as acute myocardial infarction and strokes.[5] People with kidney diseases are at greater risk of mortality from cardiovascular diseases at all stages of disease progression.[6]

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Dialysis – treatment used for the final stage of chronic kidney disease progression – is a high cost procedure. In Brazil, this treatment is almost exclusively provided by the National Health System (SUS), either directly or indirectly.[7] Having knowledge of chronic kidney disease prevalence is important for planning secondary prevention actions and promoting the population's health.[1] In the case of places with lower density of health professionals and health services, such as the state of Amazonas, such investigation takes on particular relevance.

The objective of this study was to estimate chronic kidney disease prevalence and associated factors among adults living in the Metropolitan Region of Manaus, Amazonas, Brazil.

Methods

This was a population-based cross-sectional study conducted in May and June 2015, with adults living in the Metropolitan Region of Manaus, comprised of eight municipalities – Careiro da Várzea, Iranduba, Itacoatiara, Manacapuru, Novo Airão, Presidente Figueiredo, Rio Preto da Eva and Manaus. According to the 2010 Demographic Census,[8] its population is estimated as being 2.1 million residents, accounting for more than 60% of the inhabitants of the state of Amazonas. In 2013, the metropolitan region of Manaus had a human development index (HDI) of 0.720.[9]

This analysis is part of a research project intended to estimate the use of health supplies and health services in the region.[10]

Adults aged ≥18 years old were selected by means of probabilistic sampling in three stages.[8] In the first stage, 400 primary tracts and 20 substitute tracts were randomly selected from the 2,647 urban census tracts in the metropolitan region of Manaus.[8] In the second stage, systematic sampling was used to selected households: a number between 1 and 20 was drawn randomly to determine the first household, from then on every twentieth household was visited until ten interviews were completed for each census tract. All eligible dwellers present in each household were registered on the electronic interview device and one of them was randomly selected based on pre-defined sex and age quotas, based on official estimates.[10]

The sample size was calculated as being 4,001 adults, based on a conservative estimate of 50% health service use, a 95% confidence interval, 2% absolute accuracy, a design effect of 1.5 and 2,106,322 adults living in the region.[8]

Trained interviewers gathered the data using semi-structured questionnaires interviewing participants face-to-face. All variables were self-reported. The primary outcome was self-reported prevalence of chronic kidney disease, verified by asking the following question:

"Has a doctor ever diagnosed you as having chronic kidney disease?" (yes; no).

The remaining variables used in this analysis were:

a) Sociodemographic variables
- sex (male; female);
- age (in years);
- weight (in kg);

- height (in cm);
- level of schooling (higher education; high school education; elementary education; below elementary);
- race/skin color (white; black; yellow; brown; indigenous);
- economic classification, according to the Brazil Criterion economic classification (A, B, C or D/E; where A is the wealthiest level and D/E is the poorest);
- work status (formal; informal; retired; student/housewife; does not work);
- location of city of residence within the state (interior; capital);

b) Clinical variables
- self-reported chronic diseases – hypertension, diabetes, coronary disease, hypercholesterolemia and stroke (yes; no);
- state of health (very good; good; regular; poor; very poor);
- body mass index (BMI, in kilograms per square meter [kg/m^2]: <25; 25-29.9; ≥30).

The data were described in absolute and relative frequencies. Kidney disease prevalence ratios (PR) according to the study's variable categories and 95% confidence intervals (95%CI) were calculated in bivariate analysis. Poisson regression with robust variance was used to calculate the adjusted PRs, using a hierarchical model considering the distal and proximal outcome-related variables.[11] The first block of questions was comprised of the social variables (economic classification; work status; schooling; city location). The second block contained the demographic variables (sex; age; race/skin color). The clinical variables (chronic diseases; state of health; BMI) comprised the third block of analysis. Each block was adjusted by the variables in that block and those of the level above. Statistic significance of variables with more than two categories was calculated using the Wald test, following adjusted analysis of each block. The analyses were performed using Stata 14.2 (StataCorp, College Station, Texas, USA), taking into considered the sample's complex design (svy command).

The research project was approved by the Federal University of Amazonas Research Ethics Committee (CEP/UFAN): Process No. 974.428, dated March 3rd 2015 (Certification of Submission for Ethical Appraisal [CAAE] No. 42203615.4.0000.5020). All participants signed a Free and Informed Consent form as a condition for being interviewed.

Results

A total of 4,001 adults were included in the study (Table 1). Prevalence of self-reported kidney disease was 2.1% (95%CI 1.6;2.5). There was a slight predominance of women in the sample (52.8%), as well as predominance of young adults aged 25-34 years old (28.8%), people of brown skin color (72.1%; only 1.0% considered themselves to be indigenous), individuals belonging to social class C (35.6%), high school level education (47.5%) and working informally (28.8%). The majority of interviewees lived in Manaus (86.9%). The most reported chronic diseases were hypertension (19.7%) and diabetes mellitus (6.2%). More than half the respondents reported being in a good state of health (54.3%).

The crude analysis revealed that chronic kidney disease was significantly more frequent among older people, retired people and those who self-reported their race/skin color as being brown (Table 2). Positively associated clinical factors included hypertension, diabetes, coronary disease, hypercholesterolemia and strokes (p<0.001). Following adjustment, chronic kidney disease was positively associated with age (35-44 years old, PR=2.31, 95%CI 1.02;5.21; 45-59 years old, PR=2.52, 95%CI 1.10;5.75; and ≥60 years old, PR=2.95, 95%CI 1.21;7.16), being retired (PR=2.18, 95%CI 1.05;4.51) and having had a stroke (PR=2.20, 95%CI 1.09;4.45). When compared with those with higher education, people with high school education had significantly lower self-reported kidney disease prevalence (PR=0.34, 95%CI 0.11;0.99).

Discussion

Two in every 100 adults resident in the Metropolitan Region of Manaus reported having chronic kidney disease, corresponding to more them 40,000 people. The disease was positively associated with being older, being retired and having had a stroke. The prevalence rate found was slightly higher than the national rate, based on data from the 2013 National Health Survey (PNS). That survey, like our study, also did not find differences with regard to sex, schooling and race/skin color.[11]

Table 1 – Characteristics of the included population (n=4,001) and prevalence of self-reported chronic kidney disease in the population of the Metropolitan Region of Manaus, Amazonas, 2015

Variable	n	%[a]	Prevalence % (95%CI[b])
Sex			
Male	1,888	47.2	1.7 (1.2;2.4)
Female	2,113	52.8	2.4 (1.8;3.1)
Age range (in years)			
18-24	838	20.9	1.0 (0.5;1.9)
25-34	1,152	28.8	0.7 (0.3;1.4)
35-44	843	21.1	2.3 (1.5;3.6)
45-59	772	19.3	2.9 (2.0;4.4)
≥60	396	9.9	6.0 (4.0;8.8)
Race/skin color			
White	636	15.9	1.1 (0.5;2.2)
Black	300	7.5	0.7 (0.2;2.6)
Yellow	138	3.5	2.9 (1.1;7.4)
Brown	2,886	72.1	2.4 (1.9;3.0)
Indigenous	41	1.0	2.4 (0.3;15.4)
Economic classification			
A	629	15.7	0.9 (0.4;2.1)
B	862	21.5	1.0 (0.5;2.0)
C	1,423	35.6	2.2 (1.5;3.1)
D/E	1,087	27.2	3.4 (2.4;4.6)
Education			
Higher education	158	4.0	2.5 (0.9;6.4)
High school education	1,903	47.5	1.0 (0.6;1.6)
Elementary education	649	16.2	1.4 (0.7;2.6)
Below elementary	1,291	32.3	3.9 (3.0;5.1)
Work status			
Formal	761	19.0	1.6 (0.9;2.7)
Informal	1,149	28.8	1.5 (1.0;2.4)
Retired	315	7.9	6.3 (4.1;9.6)
Student/housewife	1,199	29.9	2.3 (1.6;3.3)
Does not work	577	14.4	1.0 (0.5-2.3)
City of residence			
Interior	522	13.1	1.4 (0.7;2.8)
Capital	3,479	86.9	2.2 (1.7;2.7)

a) Percentage weighted by the complex sample used.
b) 95%CI: 95% confidence interval.

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Table 1 – Characteristics of the included population (n=4,001) and prevalence of self-reported chronic kidney disease in the population of the Metropolitan Region of Manaus, Amazonas 2015

Variable	n	%[a]	Prevalence % (95%CI[b])
Chronic diseases			
Hypertension	787	19.7	4.1 (2.9;5.7)
Diabetes	245	6.2	5.7 (3.4;9.4)
Coronary disease	203	5.1	6.9 (4.1;11.3)
Hypercholesterolemia	596	14.9	5.0 (3.5;7.1)
Stroke	104	2.6	10.5 (5.9;18.0)
State of health			
Very good	471	11.8	0.8 (0.3;2.2)
Good	2,175	54.3	1.4 (0.9;1.9)
Regular	1,108	27.6	2.9 (2.0;4.1)
Poor	193	4.9	6.2 (3.5;10.5)
Very poor	54	1.4	9.3 (3.9;20.4)
Body mass index (kg/m^2)			
<25	1,591	39.8	2.0 (1.4;2.8)
25-29.99	1,554	38.9	1.6 (1.1;2.3)
≥30	852	21.3	3.0 (2.1;4.4)

a) Percentage weighted by the complex sample used.
b) 95%CI: 95% confidence interval.

The primary outcome of this analysis was based on self-reporting of a silent disease, capable of being confused with urologic diseases and leading to outcome classification errors. Using diagnostic tools based on laboratory analysis of serum creatinine and proteinuria testing to prove the existence of kidney disease would increase confidence in the results.[12]

Chronic kidney disease prevalence increased as age increased and was also more frequent among retired people. These results may reflect both the natural process of aging and renal senescence and also harm caused by comorbidities acquired during the course of life, such as diabetes mellitus and arterial hypertension.[13]

According to this study, only strokes were associated with kidney disease. Strokes result above all from uncontrolled arterial hypertension and other cardiovascular problems, which are also risk factors for chronic kidney disease.[5] Cardiovascular diseases in patients with chronic kidney disease are more frequent and more severe than among the population without kidney impairment; strokes undoubtedly contribute to the excess mortality risk found.[1] Possibly due to low chronic kidney disease prevalence, association was not found between it and the majority of variables studied. Hypertension was the chronic disease most self-reported by the population studied and even so it was not found to be associated with kidney disease.

Association between chronic kidney disease and economic class was not significant. However, it is known that people belonging to lower social classes, in unequal societies, are more exposed to unfavorable chronic disease outcomes, thus revealing the social nature of the disease.[14] Diagnosis and adequate treatment of the disease depend on access to health services, public policies on diabetes mellitus and hypertension control, and basic health education.

Organized Primary Health Care is essential for prevention and early control of chronic kidney disease.[12] The main causes of the disease are

Table 2 – Prevalence ratio and 95% confidence interval for self-reported chronic kidney disease in the population (n=4,001) of the Metropolitan Region of Manaus, Amazonas, 2015

Variable	Crude PR[a] (95%CI[b])	P value[c]	Adjusted PR[a] (95%CI[b])	P value[c]	Block[d]
Sex		**0.112**		**0.668**	**2nd**
Male	1.00		1.00		
Female	1.43 (0.92;2.21)		1.05 (0.64;1.57)		
Age range (in years)		**<0.001**		**0.004**	**2nd**
18-24	1.00		1.00		
25-34	0.72 (0.27;1.92)		0.72 (0.27;1.95)		
35-44	2.46 (1.09;5.55)		2.31 (1.02;5.21)		
45-59	3.08 (1.39;6.85)		2.52 (1.10;5.75)		
≥60	6.24 (2.83;13.78)		2.95 (1.21;7.16)		
Race/skin color		**0.125**		**0.231**	**2nd**
White	1.00		1.00		
Black	0.61 (0.13;2.92)		0.51 (0.10;2.44)		
Yellow	2.68 (0.79;9.04)		2.34 (0.70;7.76)		
Brown	2.20 (1.02;4.77)		1.77 (0.81;3.91)		
Indigenous	2.27 (0.29;18.01)		1.39 (0.20;9.57)		
Economic classification		**0.001**		**0.135**	**1st**
A	1.00		1.00		
B	1.11 (0.40;3.11)		1.15 (0.42;3.17)		
C	2.30 (0.97;5.50)		2.11 (0.88;5.08)		
D/E	3.59 (1.52;8.46)		2.29 (0.95;5.55)		
Education		**<0.001**		**0.006**	**1st**
Higher education	1.00		1.00		
High school education	0.41 (0.14;1.18)		0.34 (0.11;0.99)		
Elementary education	0.56 (0.18;1.81)		0.41 (0.13;1.27)		
Below elementary	1.59 (0.58;4.35)		0.90 (0.32;2.57)		
Work status		**<0.001**		**0.276**	**1st**
Formal	1.00		1.00		
Informal	0.98 (0.48;2.03)		0.75 (0.37;1.52)		
Retired	4.04 (2.00;8.17)		2.18 (1.05;4.51)		
Student/housewife	1.45 (0.74;2.84)		1.08 (0.55;2.13)		
Does not work	0.66 (0.25;1.76)		0.56 (0.21;1.46)		
City of residence		**0.244**		**0.138**	**1st**
Interior	1.00		1.00		
Capital	1.54 (0.74;3.18)		1.72 (0.84;3.50)		

a) PR: prevalence ratio.
b) 95%CI: 95% confidence interval.
c) Wald test.
d) Blocks included in the analysis (1st, 2nd, 3rd), adjusted by variables the same block and those of the level above.
e) Reference: absence of the disease.

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Table 2 – Prevalence ratio and 95% confidence interval for self-reported chronic kidney disease in the population (n=4,001) of the Metropolitan Region of Manaus, Amazonas, 2015

Variable	Crude PR[a] (95%CI[b])	P value[c]	Adjusted PR[a] (95%CI[b])	P value[c]	Block[d]
Chronic diseases[e]					
Hypertension	2.59 (1.68;4.01)	<0.001	0.93 (0.53;1.65)	0.808	3rd
Diabetes	3.12 (1.78;5.46)	<0.001	1.05 (0.59;1.87)	0.860	3rd
Coronary disease	3.84 (2.20;6.70)	<0.001	1.46 (0.76;2.83)	0.255	3rd
Hypercholesterolemia	3.28 (2.11;5.09)	<0.001	1.59 (0.91;2.76)	0.103	3rd
Stroke	5.75 (3.14;10.53)	<0.001	2.20 (1.09;4.45)	0.029	3rd
State of health		**<0.001**		**0.175**	**3rd**
Very good	1.00		1.00		
Good	1.61 (0.57;4.54)		1.07 (0.37;3.11)		
Regular	3.42 (1.22;9.63)		1.41 (0.47;4.27)		
Poor	7.31 (2.39;22.41)		2.23 (0.66;7.51)		
Very poor	10.99 (3.04;39.72)		2.71 (0.70;10.49)		
Body mass index (kg/m²)		**0.059**		**0.344**	**3rd**
<25	1.00		1.00		
25-29.9	0.79 (0.47;1.33)		0.76 (0.45;1.27)		
≥30	1.51 (0.91;2.52)		1.12 (0.66;1.90)		

a) PR: prevalence ratio.
b) 95%CI: 95% confidence interval.
c) Wald test.
d) Blocks included in the analysis (1st, 2nd, 3rd), adjusted by variables the same block and those of the level above.
e) Reference: absence of the disease.

hypertension and diabetes. Good control of these conditions in Primary Care inhibits the appearance of kidney disease and delays the start of dialysis,[15,16] in addition to contributing to reducing cardiovascular complications, such as infarction and strokes, which can lead to death.[15]

The low kidney disease prevalence found in this study may reflect people's lack of knowledge about their own state of health, given the difficulty in accessing the health system, as well as unmet demand for laboratory tests, such as analysis of serum creatinine and proteinuria testing to confirm kidney impairment.[12,17]

Manaus is the only city in the state of Amazonas to offer renal replacement therapy to people with kidney disease at an advanced stage.[7] Brazilian Nephrology Society estimates suggest that prevalence of patients undergoing dialysis in Amazonas is 229 per 1 million inhabitants.[7] These data are probably underestimated, in view of the geographically isolated characteristics of the populations distributed over the huge Northern region and the difficulty in accessing health services.[10] Notwithstanding, people living in the metropolitan region studied would be precisely those with better access to health services and dialysis treatment in the state.

In conclusion, chronic kidney disease was self-reported by 2 in every 100 adults in the metropolitan region of Manaus. Relatively low awareness of the disease may reflect little access to health services, especially Primary Care. Representative studies using diagnostic tools are needed to obtain a better estimate of chronic kidney disease prevalence in the region.

Authors' Contributions

Silva MT and Galvão TF designed the study. Marinho AWGB, Silva MT and Galvão TF analyzed the data. Marinho AWGB and Galvão TF interpreted the data and drafted the first version of the manuscript. Marinho AWGB, Silva MT and Galvão TF critically reviewed the manuscript. All the authors approved the final version and are responsible for all aspects of the work, including the guarantee of its accuracy and integrity.

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