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Prevalence of self-reported chronic kidney disease in Brazil: National Health Survey of 2013

Prevalência de autorrelato de diagnóstico médico de doença renal crônica no Brasil: Pesquisa Nacional de Saúde, 2013

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ABSTRACT: ***Objective:*** To describe the profile of adults who reported medical diagnosis of chronic kidney disease (CKD), according to selected variables. ***Methods:*** In a cross-sectional study with individuals included in the National Health Survey of 2013, a household population-based study was conducted in rural and urban areas of Brazil. A total of 60,202 individuals aged ≥18 years who self-reported a medical diagnosis of chronic renal failure or kidney disease were evaluated. Descriptive statistics, including calculations of prevalence and 95% confidence intervals (95%CI), were calculated. ***Results:*** The prevalence of CKD was 1.4% (95%CI 1.3 – 1.6). It was similar between sexes: male, 1.4% (95%CI 1.1 – 1.6); and female, 1.5% ((95%CI 1.3 – 1.7). southern Brazil showed the highest frequency of this indicator (2.1%; 95%CI 1.6 – 2.7). The prevalence of dialysis among people with medical diagnosis of end stage renal disease was 7.4% (95%CI 4.4 – 10.3), being greater in males (12.4%; 95%CI 6.5 – 18.3). There was no difference between the age groups and schooling levels. CKD was referenced by 8.9% (95%CI 3.5 – 14.3) of the individuals with brown skin, with no difference among races/skin color. ***Conclusion:*** These results reveal various aspects of CKD in Brazil. The distribution of CKD was unequal, burdening especially individuals with poor education, demanding greater investments in health programs for the confrontation of CKD. Thus, these data allow the planning of public policies aimed at the prevention of this disease and health promotion.

Keywords: Renal insufficiency, chronic. Data analysis. Health surveys. Epidemiology, descriptive. Prevalence. Self-report.

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RESUMO: ***Objetivo:*** Descrever o perfil dos adultos que referiram diagnóstico médico de doença renal crônica (DRC), segundo variáveis selecionadas. ***Métodos:*** Estudo transversal em que foram incluídos indivíduos entrevistados pela Pesquisa Nacional de Saúde de 2013, estudo de base populacional e domiciliar realizado no Brasil, representativo da zona rural e urbana. Foram avaliados 60.202 indivíduos com idade ≥ 18 anos que referiram diagnóstico médico de insuficiência renal crônica ou doença renal. Foi realizada estatística descritiva, incluindo cálculos de prevalências e respectivos intervalos de confiança de 95% (IC95%). ***Resultados:*** A prevalência de DRC foi de 1,4% (IC95% 1,3 – 1,6), semelhantes entre os sexos; masculino: 1,4% (IC95% 1,1 – 1,6) e feminino 1,5% ((IC95% 1,3 – 1,7). A região Sul apresentou a maior frequência desse indicador (2,1%; IC95% 1,6 – 2,7). A prevalência de tratamento dialítico dentre as pessoas com diagnóstico médico autorreferido de DRC foi de 7,4% (IC95% 4,4 – 10,3), sendo maior no sexo masculino (12,4%; IC95% 6,5 – 18,3) e não houve diferença entre as faixas etárias e os níveis de escolaridade. DRC foi referida por 8,9% (IC95% 3,5 – 14,3) dos pardos, sem diferença entre as raças/cor da pele. ***Conclusão:*** Esses resultados revelam os diversos aspectos da DRC no país. Observou-se que a distribuição foi desigual, onerando principalmente os de menor escolaridade, o que demanda maior investimento em programas de saúde para o enfrentamento dessa enfermidade. Dessa forma, esses dados permitem direcionar o planejamento de políticas públicas voltadas à prevenção dessa doença e à promoção da saúde.

Palavras-chave: Insuficiência renal crônica. Análise de dados. Inquéritos epidemiológicos. Epidemiologia descritiva. Prevalência. Autorrelato.

INTRODUCTION

Chronic kidney disease (CKD) is a worldwide public health problem with a progressive increase in its incidence and prevalence. In addition, CKD presents an unfavorable outcome and high cost for the affected individuals, affecting every aspect of people's health: physical (increased cardiovascular disease burden, morbidity, and mortality), social (low quality of life, loss of productivity, and employment), and psychological (family pressures and mental disorders)[1-3].

CKD culminates in end-stage renal disease (ESRD) or end-stage kidney disease , when there is progressive and irreversible loss of kidney function, a serious health outcome with a high economic and social cost, which requires dialytic renal replacement therapy (hemodialysis and peritoneal dialysis) or transplants for maintenance of life. In developed countries, ESRD is largely responsible for the costs of health systems, with annual growth in dialysis programs ranging from 6 to 12% in the last two decades, and with prospected increase, especially in developing countries[4].

Therefore, the World Health Organization has encouraged countries to implement surveillance for chronic diseases and their common modifiable risk factors, such as hypertension and diabetes, which, in the case of CKD, are the major factors associated with its development[5-7]. The International Society of Nephrology has also stimulated the implementation of public policies aimed at developing screening and prevention strategies for

kidney disease, among which we highlight multidisciplinary approaches and educational activities for the population[8].

Saran et al.[9] described the need to develop a comprehensive CKD surveillance system with systematic data collection, which is vital to the establishment of the disease burden, prevention and monitoring of intervention programs, as well as the analysis and promotion of epidemiological data of patients with non-end-stage chronic kidney failure and substitutive renal treatment in the country, aiming at a better care planning and better treatment effectiveness.

Epidemiological population-based studies are useful to assess the distribution of risk factors for a disease. However, there are few experiences described in the literature on effective measures for CKD monitoring and screening[10,11]. There are global initiatives for monitoring CKD through electronic health records linked to prevention, treatment, and control programs of kidney disease, whose key strategies are: sensitization, awareness and dissemination of knowledge on the subject, its risk factors, and its complications.

In view of the need of knowledge on the real epidemiological situation of CKD in Brazil, the National Survey by Household Sampling (PNAD), carried out in 2003 and 2008, investigated the self-reported prevalence of this disease, which was 1.65 and 1.25% among adults (≥ 18 years old), respectively[12]. To continue this monitoring and contribute to the knowledge of the occurrence of CKD, the National Health Survey, in 2013, expanded the research scope, including, in addition to self-reported medical diagnosis, assessment of laboratory creatinine dosages. The laboratorial data are not yet available, but, in the future, these results will determine the prevalence of CKD by biochemical measures, according to the classification in stages, regardless of the underlying cause.

The aim of this study was to present the epidemiological profile of adults (≥ 18 years old) with self-reported CKD.

METHODS

On the basis of the data from the National Health Survey (PNS), a population-based survey was conducted in 2013. Sampling was performed by clusters in three stages, in which census tract or group of tracts were the primary units; households were the secondary units; and adult residents aged ≥ 18 years constituted the tertiary sampling units. One adult resident was interviewed in each of the 62,986 households distributed throughout the Brazilian territory. The total number of adults who responded to the section on chronic diseases and lifestyles was 60,202. Detailed information on the methodology can be found in a specific publication[13]. PNS is the product of the partnership between the Ministry of Health and the Brazilian Institute of Geography and Statistics.

For this study, the following indicators were selected for the adult population regarding the medical diagnosis of CKD:

- prevalence (%) of self-reported medical diagnosis of chronic kidney disease or CKD;

- prevalence (%) of self-reported dialysis among adults who reported a diagnosis of chronic kidney disease or CKD;
- prevalence (%) of intense or very intense degree of limitations in activities of daily living due to chronic kidney failure in adults who self-reported a diagnosis of chronic kidney disease or CKD.

Confidence intervals of 95% (95%CI) were also calculated for the above prevalences by gender, age, race/skin color, and education for Brazil and regions. Stata version 11.0 software was used for data analysis, with the svy command for complex samples. The PNS was approved by the National Research Ethics Committee, under protocol number 328.159, in June 26, 2013.

RESULTS

Among the adults interviewed, the prevalence of self-reported medical diagnosis of CKD was of 1.4% (95%CI 1.3 – 1.6), statistically similar between the sexes: males 1.4% (95%CI 1.1 – 1.6); and females 1.5% (1.3 – 1.7), as shown in Table 1. The prevalence of self-reported medical diagnosis of CKD increased with age, being higher from the age of 60 years, and was higher among those with no education and with incomplete primary education (2.1%; 95%CI 1.7 – 2.4).

There were no statistically significant differences in the prevalence of self-reported medical diagnosis of CKD according to race/skin color. The south region had the highest prevalence of this indicator (2.1%; 95%CI 1.6 – 2.7) (Table 1).

The prevalence of dialytic treatment among those who reported a medical diagnosis of CKD and ESRD in the adult population was of 7.4% (95%CI 4.4 – 10.3), being higher in males (12.4%; 95%CI 6.5 – 18.3). There was no statistically significant difference between age groups and levels of education (Table 2). ESRD was reported by 8.9% (95%CI 3.5 – 14.3) individuals with brown skin, with no statistically significant difference between the races/skin colors. There were no statistically significant differences between the regions in this indicator. The percentage of people aged 18 years or older who reported a medical diagnosis of CKD and intense or very intense degrees of limitations in activities of daily living due to illness was 11.9% (95%CI 8.2 – 15.5), statistically similar in both sexes, in all age groups, education levels, skin colors/races, urban and rural areas, and regions (Table 3).

DISCUSSION

Although this disease is relevant in terms of magnitude and significance, there are few experiences described in the literature on effective measures for monitoring and screening CKD.

Table 1. Prevalence of self-reported medical diagnosis of chronic kidney failure/kidney disease among adults according to studied variables. Brazil, 2013 (n = 60,202).

Characteristics	%	95%CI	CV (%)
Brazil	1.4	1.3 – 1.6	5.8
Sex			
Male	1.4	1.1 – 1.6	8.5
Female	1.5	1.3 – 1.7	7.6
Area of residence			
Urban	1.4	1.2 – 1.6	6.5
Rural	1.4	1.0 – 1.8	12.8
Region			
North	1.2	0.9 – 1.5	12.4
Northeast	1.2	0.9 – 1.4	11.4
Southeast	1.3	1.1 – 1.6	10.4
South	2.1	1.6 – 2.7	12.4
Midwest	1.6	1.2 – 2.0	12.9
Age group (years)			
18 – 29	0.5	0.4 – 0.7	15.6
30 – 59	1.4	1.2 – 1.6	7.5
60 – 64	2.0	1.3 – 2.7	17.0
65 – 74	2.9	2.0 – 3.8	15.6
75 and over	3.6	2.1 – 5.0	20.7
Education levels			
Uneducated and incomplete primary education	2.1	1.7 – 2.4	7.9
Complete primary education and incomplete secondary education	1.2	0.9 – 1.5	12.9
Complete secondary education and incomplete superior education	0.9	0.7 – 1.2	11.7
Complete superior education	1.0	0.6 – 1.3	18.0
Race/skin color			
White	1.6	1.3 – 1.8	8.3
Black	1.5	0.9 – 2.1	21.4
Brown	1.2	1.0 – 1.4	8.7

95%CI: 95% confidence interval; CV: coefficient of variation (when CV > 20%, we recommend interpreting these results with caution).

Table 2. Prevalence of self-reported medical diagnosis of end-stage renal disease among adults according to studied variables. Brazil, 2013 (n = 60,202).

Characteristics	%	95%CI	CV (%)
Brazil	7.4	4.4 – 10.3	20.3
Sex			
Male	12.4	6.5 – 18.3	25.4
Female	3.3	1.4 – 5.1	28.0
Area of residence			
Urban	7.1	3.9 – 10.3	23.0
Rural	9.2	2.0 – 16.5	41.4
Region			
North	2.7	0.2 – 5.2	48.5
Northeast	8.9	3.7 – 14.2	29.6
Southeast	7.8	2.2 – 13.4	36.7
South	5.8	0.6 – 10.9	45.5
Midwest	8.8	0.2 – 17.4	50.9
Age group (years)			
18 – 29	1.6	0.0 – 3.7	62.9
30 – 59	7.6	4.5 – 10.8	20.8
60 – 64	10.1	0.0 – 22.1	63.4
65 – 74	7.8	0.0 – 16.3	57.3
75 and over	8.6	0.0 – 22.5	85.9
Education levels			
Uneducated and incomplete primary education	6.2	2.0 – 10.3	34.5
Complete primary education and incomplete secondary education	11.4	3.6 – 19.3	36.2
Complete secondary education and incomplete superior education	4.8	1.3 – 8.4	35.8
Complete superior education	15.7	2.9 – 28.5	44.3
Race/skin color			
White	5.3	2.5 – 8.1	26.7
Black	7.5	0.0 – 19.9	86.0
Brown	8.9	3.5 – 14.3	32.0

95%CI: 95% confidence interval; CV: coefficient of variation (when CV > 20%, we recommend interpreting these results with caution).

Table 3. Prevalence of self-reported medical diagnosis of chronic kidney failure/kidney disease and reported intense or very intense degree of limitation on activities of daily living in adults due to chronic kidney failure according to studied variables. Brazil, 2013 (n = 60,202).

Characteristics	%	95%CI	CV (%)
Brazil	11.9	8.2 – 15.5	16.4
Sex			
Male	14.1	7.8 – 20.5	24.5
Female	10.0	5.8 – 14.1	22.5
Area of residence			
Urban	11.0	7.1 – 14.9	18.9
Rural	17.5	8.1 – 27.0	31.3
Region			
North	13.4	1.9 – 25.0	47.9
Northeast	11.8	5.6 – 17.9	28.4
Southeast	6.5	1.7 – 11.3	37.6
South	20.9	10.7 – 31.0	29.4
Midwest	13.6	3.7 – 23.5	38.5
Age group (years)			
18 – 29	19.5	4.5 – 34.6	45.4
30 – 59	11.9	7.3 – 16.5	20.5
60 – 64	20.4	4.3 – 36.5	45.8
65 – 74	2.5	0.0 – 5.2	51.6
75 and over	11.6	0.0 – 25.7	65.2
Education levels			
Uneducated and incomplete primary education	13.2	8.3 – 18.1	20.1
Complete primary education and incomplete secondary education	4.7	0.1 – 9.3	49.9
Complete secondary education and incomplete superior education	9.7	1.7 – 17.7	43.9
Complete superior education	19.1	4.3 – 33.8	43.4
Race/skin color			
White	10.5	5.4 – 15.7	25.3
Black	1.5	0.0 – 3.5	65.2
Brown	14.2	8.0 – 20.3	24.3

95%CI: 95% confidence interval; CV: coefficient of variation (when CV >20%, we recommend interpreting these results with caution).

It was observed that there are many global strategies and initiatives for the monitoring of ESRD through electronic health records linked to prevention, treatment, and control programs of kidney disease, having as its key strategies: sensitization, awareness, and dissemination of knowledge on the subject; its risk factors; and its complications, in order to reduce the impact of kidney disease on public health[10,11].

The main experience of self-reported monitoring described was in the USA, where surveillance of CKD is carried out by various national and regional organizations, which are committed to the task of fighting CKD in their country. We highlight the monitoring of CKD in different degrees of advance through the National Health and Nutrition Examination Survey, between 1999 and 2004, involving a representative sample of the population aged 20 years or older (n = 13,233). The study found a prevalence of CKD of 13% in stages 1 – 4, determined by the presence of persistent albuminuria (> 30 mg/g), and decreased glomerular filtration rate, using the abbreviated equation in the study Modification of Diet in Renal Disease[14,15].

Other countries usually just monitor ESRD through records of dialysis and transplants. We highlight the European Dialysis and Transplant Association (ERA-EDTA), the oldest CKD record in the world, created in 1965, collecting data on CKD through national and regional kidney records in Europe; in Latin America and the Caribbean, we highlight the monitoring of the Latin American Society of Nephrology and Hypertension Dialysis and Renal Transplantation Registry, created in 1991, to gather information and produce reports on the incidence and prevalence of ESRD and renal replacement therapy (RRT) in the region[16,17].

In Brazil, this self-report monitoring was initiated by PNAD, in 2003[12]. In this study, the prevalence of self-reported medical diagnosis of CKD was reported by 1.4% adults, accounting for 2.08 million of Brazilians. A positive relationship was observed between the frequency of this indicator and increasing age. However, the relationship was reversed with level of education, used as the socioeconomic proxy.

Although, in this study, the socioeconomic level did not show relevance, it should be noted that CKD disproportionately affects the poor and socially disadvantaged, a situation that is likely to worsen in the coming decades. Studies have shown that low socioeconomic status is associated with microalbuminuria, macroalbuminuria, reduced TGF, progressive loss of kidney function, ESRD, and access to kidney transplantation[18,19]. Developed and developing countries have shown similar associations. It is noteworthy that the global burden of CKD is already higher in developing countries compared to developed countries, and due to the epidemic of diabetes, hypertension, and cardiovascular disease, this burden will grow rapidly in these low-income countries[20,21].

Barros et al.[12] compared the results obtained from the PNAD in 2003 and 2008 according to social strata defined by level of education and owning or not owning private health insurance. This study demonstrated that there was a decrease (-25%) in the prevalence of self-reported medical diagnosis of CKD in the country for the period. However, there were

greater prevalence ratios between strata with lower and higher education levels, for self-report of medical diagnosis of CKD, reflecting the magnitude of inequalities in this disease. This study observed that this difference is still present in Brazil.

The higher prevalence of self-reported medical diagnosis of CKD in the southern region of the country may be the result of the greater availability of health services, facilitating access to diagnosis. However, De Moura et al.[22], analyzing a historical series on ESRD for Brazilian regions from 2000 to 2012, found a slight increase in the incidence of ESRD in all regions except the south, which may reflect early diagnosis in this region, preventing kidney failure.

The increasing prevalence of adults who reported a medical diagnosis of ESRD among men and in the > 60 years age groups for both sexes is a pattern of occurrence of the disease's incidence, similar to those described by Brazilian studies evaluating the distribution of dialytic treatments in the country and in international studies in middle-and high-income countries[21,24].

There was a higher prevalence of self-reported medical diagnosis of CKD among individuals who identified as brown. According to Scialla et al.[25], people with black skin color (black and brown) are more likely to develop ESRD due to the increased frequency of cases of glomerulonephritis, hypertension, and diabetic nephropathy in these individuals.

It is noteworthy that in this study, 16 of every 100 adults with superior education reported a medical diagnosis of CKD and were undergoing hemodialysis or dialysis. These data suggest inequalities of access to and problems in the quality of care for ESRD, especially regarding education, gender, geographic region, and race/skin color. However, in this study, we could not confirm this finding, which partly reflects the small number of events found in the general population.

ESRD contributes to functional losses, impairing the individual's independence causing damage in the physical, mental, functional, general welfare, social interaction, and satisfaction aspects of individuals undergoing dialysis. One aspect considered in this study was the ability to search data on the degree of intensity of limitations in activities of daily living due to CKD, and approximately 12% adults reported limitations with intense or very intense degrees.

CONCLUSION

In short, CKD is a major global public health problem, is an important factor in mortality, and has high morbidity related to cardiovascular disease, hypertension, anemia, susceptibility to infection, hepatitis B and C, bone diseases, malnutrition, and other less defined causes. Most people affected worldwide have no access to RRT; the distribution is uneven, which mainly burdens the poorest, requiring greater investment in health programs to fight CKD, including its monitoring, primary prevention, and line of comprehensive care.

As study limitations, we can cite the high coefficient of variation, hindering deeper conclusions about probable associated factors. Also, the use of self-reported measures, as it only deals with cases that have a medical diagnosis.

The data presented showed the various aspects of CKD in Brazil and illustrated the importance of coping actions for this disease. Therefore, it is essential to create and maintain a national system for information, analysis, and dissemination of epidemiological data of patients with CKD in the country. Moreover, it is necessary to plan primary and secondary prevention actions for CKD and to develop assessment strategies of the implemented programs.

REFERENCES

1. Hamer RA, El Nahas AM. The burden of chronic kidney disease. BMJ 2006; 332(7541): 563-4.
2. Chen CK, Tsai YC, Hsu HJ, Wu IW, Sun CY, Chou CC, et al. Depression and suicide risk in hemodialysis patients with chronic renal failure. Psychosomatics 2010; 51(6): 528-528.e6.
3. Johansen KL, Chertow GM, Kutner NG, Dalrymple LS, Grimes BA, Kaysen GA. Low level of self-reported physical activity in ambulatory patients new to dialysis. Kidney Int. 2010; 78(11): 1164-70.
4. Eggers PW. Has the incidence of end-stage renal disease in the USA and other countries stabilized? Curr Opin Nephrol Hypertens 2011; 20(3): 241-5.
5. Armstrong T, Bonita R. Capacity building for an integrated noncommunicable disease risk factor surveillance system in developing countries. Ethn Dis 2003; 13(2 Suppl 2): S13-8.
6. Romão Júnior JE. Doença renal crônica: definição, epidemiologia e classificação. J Bras Nefrol 2004; 26(3): 1-3.
7. Oliveira MB, Romao Junior JE, Zatz R. End-stage renal disease in Brazil: epidemiology, prevention, and treatment. Kidney Int Suppl 2005; (97): S82-6.
8. Ruggenenti P, Remuzzi G. Kidney failure stabilizes after a two-decade increase: impact on global (renal and cardiovascular) health. Clin J Am Soc Nephrol 2007; 2(1): 146-50.
9. Saran R, Hedgeman E, Huseini M, Stack A, Shahinian V. Surveillance of chronic kidney disease around the world: tracking and reining in a global problem. Adv Chronic Kidney Dis 2010; 17(3): 271-81.
10. Hallan SI, Dahl K, Oien CM, Grootendorst DC, Aasberg A, Holmen J, et al. Screening strategies for chronic kidney disease in the general population: follow-up of cross sectional health survey. BMJ 2006; 333(7577): 1047.
11. de Jong PE, van der Velde M, Gansevoort RT, Zoccali C. Screening for chronic kidney disease: where does Europe go? Clin J Am Soc Nephrol 2008; 3(2): 616-23.
12. Barros MB, Francisco PM, Zanchetta LM, César CL. [Trends in social and demographic inequalities in the prevalence of chronic diseases in Brazil. PNAD: 2003- 2008]. Cien Saude Colet 2011; 16(9): 3755-68. Portuguese.
13. Instituto Brasileiro de Geografia e Estatística (IBGE). Pesquisa Nacional de Saúde: 2013. Percepção do estado de saúde, estilos de vida e doenças crônicas. Rio de Janeiro: IBGE; 2014. Disponível em: ftp://ftp.ibge.gov.br/PNS/2013/pns2013.pdf. (Acessado em 22 de dezembro de 2014).
14. Centers for Disease Control and Prevention (CDC). Prevalence of chronic kidney disease and associated risk factors: United States, 1999-2004. MMWR Morb Mortal Wkly Rep 2007; 56(8): 161-5.
15. Rao MV, Qiu Y, Wang C, Bakris G. Hypertension and CKD: Kidney Early Evaluation Program (KEEP) and National Health and Nutrition Examination Survey (NHANES), 1999-2004. Am J Kidney Dis 2008; 51(4 Suppl 2): S30-7.
16. Kramer A, Stel V, Zoccali C, Heaf J, Ansell D, Grönhagen-Riska C, et al. An update on renal replacement therapy in Europe: ERA-EDTA Registry data from 1997 to 2006. Nephrol Dial Transplant 2009; 24(12): 3557-66.
17. Fernández-Cean J, González-Martínez F, Schwedt E, Mazzuchi N. Renal replacement therapy in Latin America. Kidney Int 2000; 57: S55-9.
18. Martins D, Agodoa L, Norris K. Kidney disease in disadvantaged populations. Int J Nephrol 2012; 469265.

19. Merkin SS, Coresh J, Diez Roux AV, Taylor HA, Powe NR. Area socioeconomic status and progressive CKD: the Atherosclerosis Risk in Communities (ARIC) Study. Am J Kidney Dis 2005; 46(2): 203-13.
20. Arogundade FA, Barsoum RS. CKD prevention in Sub-Saharan Africa: a call for governmental, nongovernmental, and community support. Am J Kidney Dis 2008; 51(3): 515-23.
21. Barsoum RS. End-stage renal disease in the developing world. Artif Organs 2002; 26(9): 735-6.
22. de Moura L, Prestes IV, Duncan BB, Thome FS, Schmidt MI. Dialysis for end stage renal disease financed through the Brazilian National Health System, 2000 to 2012. BMC Nephrol 2014; 15: 111.
23. Cherchiglia ML, Machado EL, Szuster DAC, Andrade EIG, Acúrcio FA, Caiaffa WT, et al. Perfil epidemiológico dos pacientes em terapia renal substitutiva no Brasil, 2000-2004. Rev Saúde Pública 2010; 44(4): 639-49.
24. Sesso RC, Lopes AA, Thomé FS, Lugon JR, Watanabe Y, dos Santos DR. Brazilian Chronic Dialysis Survey 2013: trend analysis between 2011 and 2013. J Bras Nefrol 2014; 36(4): 476-81.
25. Scialla JJ, Appel LJ, Astor BC, Miller ER 3rd, Beddhu S, Woodward M. Net endogenous acid production is associated with a faster decline in GFR in African Americans. Kidney Int 2012; 82(1): 106-12.
26. Belasco AG, Sesso R. Burden and quality of life of caregivers for hemodialysis patients. Am J Kidney Dis 2002; 39(4): 805-12.

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