Health care for people with diabetes and hypertension in Brazil: cross-sectional study of Program for Improving Access and Quality of Primary Care, 2014

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Abstract

Objective: To assess health care for people with diabetes and hypertension, comparing the teams according to their participation in both cycles I and II of the Program for Improving Primary Health Care Access and Quality (PMAQ), and to verify its association with the characteristics of service users and municipalities. **Methods:** This was a cross-sectional study using PMAQ data from 2014. The following variables were used: team organization, request for tests and health care reported by service users. **Results:** Thirty-five percent of the teams presented adequate organization and 88% requested all tests. Among the users, 31% had their feet examined and 18% received adequate health care. Municipalities in the Southeast region, with more than 300,000 inhabitants and the highest human development index, presented the best indicators. The teams that took part in both cycles I and II showed greater prevalence of organization and request for tests. **Conclusion:** Health care for people with diabetes and hypertension in primary health care in Brazil needs improvement.

Keywords: Diabetes *Mellitus*; Hypertension; Multimorbidity; Primary Health Care; Healthcare Survey.

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Introduction

The occurrence of chronic non-communicable diseases (NCDs), including diabetes *mellitus* and systemic arterial hypertension, has been increasing worldwide.[1-4] In Brazil, the prevalence of diabetes in adults was about 3% in 1998,[1] 6% in 2013[1] and 8% in 2018;[2] and hypertension, approximately 19% in 1998,[1] 22% in 2013[1] and 25% in 2018.[1] A study conducted by Malta et al.,[5] published in 2017, showed that people with diabetes are almost three times more likely to develop hypertension when compared to those without the disease, the same can be observed in people with hypertension and its relationship with diabetes.[6] The prevalence of concomitant diabetes and hypertension in Brazil, according to data from the National Health Survey (PNS), was about 5% in adults, and 14% in the elderly (60 years of age or older).[7]

> *Structuring a health system based on primary health care is one of the main measures that could be adopted by countries in order to reduce inequities and improve health care system efficiency.*

A person with diabetes and hypertension can be considered with multimorbidity, that is, the co-occurrence of two or more chronic conditions in the same individual.[8] Multimorbidity is a public health problem, given its high prevalence: in 2017, it reached 24% of adults in Brazil,[9] with a growing trend over the years.[4] Among the consequences of multimorbidity are the increased risk of death[10] and a negative impact on quality of life and life expectancy.[11]

There is evidence that the higher the number of morbidities, the higher the frequency of health services utilization at any level of care.[12] Structuring a health system based on primary health care (PHC) is one of the main measures that could be adopted by countries in order to reduce inequities and improve health care system efficiency.[13] In Brazil, there has been an increasing number of people seeking for PHC services. According to PNS data, more than half of the population sought these services as a priority, in view of health needs.[7]

Among its assignments, PHC provides NCD prevention actions, management of these diseases and their complications. Health services should be prepared to meet this demand, with qualified professionals who are able to plan and provide health care to this population, especially those who have concomitant morbidities.[14]

The Program for Improving Primary Health Care Access and Quality (PMAQ) is a strategy of the Brazilian Ministry of Health, and its main objective is to induce the access expansion and quality improvement of primary care in the Brazilian National Health System (SUS). Health team adherence to PMAQ is voluntary. After PMAQ evaluation, the teams receive a financial incentive according to their quality standards. The program was implanted in the country about ten years ago. Thus far there have been three PMAQ cycles, which allows to evaluate, from cycle I (2012), through cycle II (2014) and cycle III (2017): (i) the structure of the primary health center (PHC); (ii) the work process as reported by health teams; and (iii) quality of care delivered as evaluated by service users.[15]

There are evaluation studies on the quality of services aimed at people either with hypertension or diabetes, although, when it comes to the care of people with the two concomitant diseases, the literature is scarce.[16-18] In addition, no studies have been published to evaluate the performance of the teams according to their history of exposure to different PMAQ cycles.

The objective of this study was to evaluate health care for people with diabetes *mellitus* and systemic arterial hypertension, to compare the teams according to their performance in PMAQ cycles I and II, and to verify the association between this multimorbidity and the characteristics of service users and their municipalities of residence.

Methods

This study represents an external evaluation of cycle II of the Program for Improving Primary Health Care Access and Quality in Brazil. It had a cross-sectional, service-based design on data available on the Ministry of Health's open access website.[15] The evaluations were conducted by higher education institutions with primary healthcare (PHC) teams from all over the country, from December 2013 to March 2014.

The study included PHC teams indicated by the municipal management. The data used were collected using three instruments: the first one observed primary health center structure adequacy (module I); the second characterized the organization of services and health team work process, by means of interviews with health professionals (module II); and the third investigated access, use and quality of health care, according to the users' perception (module III). This article used data from modules II and III.

The sample section analyzed was comprised of service users aged 18 years or older, with diabetes *mellitus* (DM) and systemic arterial hypertension (SAH), who were at the PHC at the time of evaluation, in addition to the health teams that provided care to these patients. The diagnosis of the diseases was obtained from the answers to the following questions:

Have you ever been told that you have high blood pressure or hypertension by a doctor?

Have you ever been told that you have diabetes or high blood sugar by a doctor?

Those who answered these questions affirmatively were considered eligible. In the end, the study sample was comprised of 11,495 service users, presenting the characteristics mentioned, and 11,437 PHC teams linked to them.

Regarding team organization (module II), the following dichotomous variables were selected (yes, no response):

   a) Education group

Does the team provide health promotion and education actions in self-management support groups for NCDs?

   b) Prescription refill

Does the team refill prescriptions for users of continuing care programs such as hypertension and diabetes, without an appointment?

   c) Test results

Is there a reserve of vacancies into their schedule or easy access to health professionals, thus the user can get his or her test results?

Moreover, it was investigated whether the team had a record of service users with DM and SAH living in their territory, an active search for service users with these morbidities was performed and risk stratification protocols were used to identify risks for DM and SAH. Team organization was considered adequate when positive responses were given to all the aforementioned variables.

With regard to module II, it was investigated whether the health teams had requested the following tests (yes, no response): creatinine, electrocardiogram, glycosylated hemoglobin and lipid profile. The request for tests was considered adequate when positive answers were given to the questions related to all these tests.

Regarding the quality of health care according to user's perception (module III), the variables used were also dichotomized between 'yes' and 'no': blood pressure measurement by a health professional; medical tests (creatinine, electrocardiogram, fasting blood glucose and lipid profile) in the last six months; and foot examination performed by a health professional in the last six months. Adequate health care was considered when all the items were affirmatively mentioned by the users.

Adequate team organization and adequate request for test outcomes were evaluated according to the characteristics of the municipalities: geopolitical region of location (North, Northeast, Mid-west, Southeast and South); population size, according to 2010 Demographic Census[19] (in inhabitants: up to 10,000; 10,001 to 30,000; 30,001 to 100,000; 100,001 to 300,000; more than 300,000); and the municipal human development index (HDI)[20] (classified in quartiles, being the first quartile related to the municipalities with the lowest HDI and the last quartile, to those with the highest HDI: 0.467 to 0.642; 0.643 to 0.730; 0.731 to 0.787; 0.788 to 0.919).

'Adequate health care reported by the user' outcome was evaluated according to the characteristics of the municipalities (region, population size and HDI) and individual characteristics of the PHCC users: sex (male; female); age group (in years: 18 to 39; 40 to 59; 60 or older); race/skin color (white; black; brown; Asian/indigenous); and schooling (cannot read/write; incomplete elementary school; complete elementary school; complete high school; complete higher education).

The data were collected using electronic forms, inserted in tablets, and automatically sent to the Ministry of Health central server. Analyses of inconsistencies and the quality of database were the responsibility of the six higher education institutions that led the external evaluation process.

Prevalence and 95% confidence intervals (95%CI) were estimated for each variable. The prevalence and confidence intervals of the team's outcomes (adequate team organization; adequate request for tests) were also calculated regarding the characteristics of the municipalities; and adequate health care reported by the service users, related to the characteristics of the municipalities and individual characteristics of PHCC users. All analyses were stratified by the variable 'participating teams in PMAQ cycles' (teams that took part in cycles I and II and teams that took part only in cycle II), given that the main objective of the study was to show the effect of the program on indicators of quality of care provided to the service users with DM and SAH.

The analyses were performed using Stata 12.1 statistical package (StataCorp LP, College Station, USA).

The study project was approved by the Human Research Ethics Committee of the Faculty of Medicine of the Federal University of Pelotas (CEP/FAMED/UFPel), on December 10, 2013. Protocol No. 487,055/2013. All participants signed a Free and Informed Consent Form.

Results

A total of 29,778 health teams and 114,615 service users were evaluated in PMAQ cycle II. Of the total number of service users, 11,495 (10%) with diabetes and hypertension, were eligible to comprise the sample of individuals in the study, together with 11,437 health teams linked to them: 6,569 teams took part in cycles I and II; and 4,868 took part only in cycle II.

Regarding team organization, each of the items evaluated was found in more than 60% of them. Among the teams that took part in PMAQ cycles I and II, the prevalence was 37.8% (95%CI 36.6;39.0) of adequate organization, while in those that took part only in cycle II, this prevalence was 31.5% (95%CI 30.2;32.9). More than 90% of the teams reported requesting each of the tests that were investigated. The adequate request for tests was more frequent in the teams that took part in cycles I and II (89.5% - 95%CI 88.8;90.3), compared to the teams that took part only in cycle II (85.5% - 95%CI 84.5;86.5). Regarding health care reported by service users, the prevalence of blood pressure measurement and fasting blood glucose was 85%, while only one third of the service users had their feet examined in the last six months.

Adequate health care was present in less than one fifth of service users: 18.4% (95%CI 17.4;19.4) among service users who took part in both cycles I and II, and 16.8% (95%CI 15.6;18.0) among those who took part only in cycle II (Table 1).

With regard to the teams, 47.5% worked in municipalities in the Southeast region, with more than 300,000 inhabitants (28,4%), and with higher HDI (41.9%). The highest prevalence of teams with adequate organization for the care of people with diabetes and hypertension was found in the Southeast region (42.6%), in municipalities with more than 300,000 inhabitants (42,9%) and with the highest HDI (39.7%). The teams that took part in cycles I and II, when compared to those that took part only in cycle II, presented higher prevalence of adequate organization in the Northeast region, in municipalities with a population size between 10,001 and 100,000 inhabitants. and in those with HDI from the first to the third quartile (Table 2).

The highest prevalence of adequate request for tests was found in the Southeast (92.8%) and South (93.3%), in municipalities with more than 300,000 inhabitants (94,2%) and in those with the highest HDI (94.7%). The health teams that took part in PMAQ cycles I and II, presented a higher prevalence of request for tests, when compared to those that took part only in cycle II. These differences were significant in the North and Northeast regions, in municipalities with 10,001 to 30,000 inhabitants. and in those with HDI categorized in the first and third quartiles (Table 2).

The distribution of the sample of service users according to municipal characteristics was quite similar to that of the teams. Regarding individual characteristics, most service users were female (72.5%), were 60 years of age or older (56.2%), were of white race/skin color (40.2%) and reported incomplete elementary school (57.5%). The highest prevalence of adequate health care, according to service users, was attributed to teams from the Southeast region (21.9%), municipalities with more than 300,000 inhabitants. (20,9%) and with the highest HDI (22.4%). With regard to the prevalence of these variables, according to service users, there were no differences regarding the teams that took part in PMAQ cycles I and II or those that took part only in cycle II (Table 3).

Table 1 – Prevalence and confidence intervals of team organization indicators, clinical practice and care reported by users, health care for people with diabetes and hypertension, stratified by participation in PMAQ cycles[a], Brazil, 2014

Variables	Cycles I e II	Only cycle II	Total sample
	% (95%CI)[b]	% (95%CI)[b]	% (95%CI)[b]
Team organization (module II)	**n=6,569**	**n=4,868**	**n=11,437**
Educational group for NCDs	77.4 (76.4;78.4)	71.4 (70.1;72.7)	74.9 (74.1;75.7)
Prescription refill	86.6 (85.8;87.4)	84.6 (83.6;85.6)	85.8 (85.1;86.4)
Test results	79.9 (78.9;80.8)	76.2 (75.1;77.4)	78.3 (77.6;79.1)
Reported in the territory (/SAHDM)	92.2 (91.6;92.9)	88.0 (87.0;88.9)	90.4 (89.9;91.0)
Active search (SAH/DM)	74.2 (73.2;75.3)	71.2 (70.0;72.5)	72.9 (72.1;73.7)
Risk stratification (SAH/DM)	73.7 (72.6;74.8)	61.4 (60.0;62.8)	68.5 (67.6;69.3)
Adequate team organization	**37.8 (36.6;39.0)**	**31.5 (30.2;32.9)**	**35.2 (34.3;36.0)**
Request for tests (module II)	**n=6,569**	**n=4,868**	**n=11,437**
Creatinine	983 (98.0;98.6)	97.7 (97.3;98.1)	98.0 (97.8;98.3)
Electrocardiogram	97.3 (96.9.97.7)	95.9 (95.3;96.4)	96.7 (96.3.97.0)
Glicosylated hemoglobin	94.8 (94.2;95.3)	92.2 (91.5;93.0)	93.7 (932.;94.1)
Lipid profile	95.4 (94.8;95.9)	92.9 (92.2;93.6)	94.3 (93.9;94.7)
Adequate request for tests	**89.5 (88.8;90.3)**	**85.5 (84.5;86.5)**	**87.8 (87.2;88.4)**
Health care reported by service users (module III)	**n=6,569**	**n=4,868**	**n=11,495**
Blood pressure measurement	97.8 (97.5;98.2)	97.6 (97.2;98.1)	97.8 (97.5;98.0)
Creatinine	60,9 (59,6;62,2)	58,9 (57,4;60,5)	60,1 (59.0;61.0)
Electrocardiogram	59.3 (58.0;60.6)	58.0 (56.5;59.6)	58.7 (57.7;59.7)
Foot examination	32.8 (31.7;34.0)	29.6 (28.3;30.9)	31.4 (30.6;32.3)
Fasting blood glucose	88.4 (87.6;89.2)	87.8 (86.9;88.7)	88.2 (87.7;88.7)
Lipid profile	62.9 (61.6;64.2)	61.5 (60.0;63.0)	62.3 (61.3;63.3)
Adequate health care reported by service users	**18.4 (17.4;19.4)**	**16.8 (15.6;18.0)**	**17.7 (16.9;18.5)**

a) PMAQ: Program for Improving Primary Health Care Access and Quality; b) 95%CI: 95% confidence interval.

Discussion

This study showed that health care for people with diabetes *mellitus* and systemic arterial hypertension in Primary Health Care in Brazil was considered inadequate, especially regarding the team organization; and the quality of care delivered, according to service users. About one third of the teams in the primary health care centers presented adequate organization, while less than one fifth of service users reported having received adequate health care. On the other hand, 90% of the teams presented adequate request for tests. In general, the teams that took part in cycles I and II presented better results related to organization and request for tests, compared to those that took part only in cycle II.

With regard to the items of adequate organization evaluated, risk stratification presented a lower prevalence. Stratification according to health risk is an important strategy for PHC, as it helps to induce access. In general, people with lower health risks have a number of medical visits considered greater than necessary, and others at higher risk and more vulnerable do not have access to the health care services they need.[13]

The tests that were evaluated are part of the clinical protocols of the Ministry of Health aimed at the initial care and follow-up of the person with DM and SAH.[21,22] Their findings show that the tests have been requested by most teams; however, approximately six out of ten

Table 2 – Prevalence and confidence intervals of adequate team organization and adequate request for tests, related to health care for people with diabetes and hypertension, according to the characteristics of the municipalities, stratified by team participating in PMAQ cycles,[a] Brazil, 2014

Variables	Number of teams (%)[d]	Adequate team organization[b]			Adequate request for tests[c]		
		Cycles I e II	Only cicle II	Total sample	Cycles I e II	Only cycle II	Total sample
		% (95%CI)[e]	% (95%CI)[e]	% (95%CI)[e]	% (95%CI)[e]	% (95%CI)[e]	% (95%CI)[e]
Regions of the country							
North	484 (4.4)	24.0 (18.0;30.0)	16.5 (11.9;21.1)	19.8 (16.1;23.5)	73.0 (67.0;79.0)	60.6 (54.7;66.5)	66.1 (61.9;70.3)
Northeast	2,592 (23.6)	36.0 (33.4;38.6)	26.6 (24.1;29.0)	31.4 (29.6;33.2)	83.7 (81.6;85.7)	78.5 (76.2;80.7)	81.1 (79.6;82.6)
Mid-West	1,003 (9.1)	24.9 (21.1;28.6)	23.1 (19.2;27.0)	24.0 (21.3;26.7)	81.6 (78.2;84.9)	81.5 (78.1;85.0)	81.6 (79.2;84.0)
Southeast	5,217 (47.5)	43.9 (42.1;54.6)	40.3 (38.1;42.5)	42.6 (41.2;43.9)	92.8 (92.0;93.7)	92.7 (91.5;93.8)	92.8 (92.1;93.5)
South	1,689 (15.4)	31.3 (28.6;34.1)	24.9 (21.1;28.6)	29.3 (27.1;31.5)	94.3 (92.9;95.6)	91.3 (88.9;93.7)	93.3 (92.1;94.5)
Population size (inhab.)							
Up to 10.000	1,279 (11.6)	32.5 (29.2;35.9)	27.9 (23.9;31.9)	30.8 (28.2;33.3)	87.8 (85.5;90.1)	83.6 (80.4;86.9)	86.2 (84.3;88.1)
10.001 to 30.000	2,601 (23.7)	36.6 (34.2;39.1)	24.3 (21.7;26.9)	31.5 (29.7;33.3)	84.7 (82.9;86.5)	75.9 (73.4;78.4)	81.0 (79.5;82.5)
30.001 to 100.000	2,335 (21.3)	33.3 (30.7;35.9)	25.8 (23.1;28.6)	30.0 (28.1;31.9)	86.1 (84.2;88.0)	82.8 (80.5;85.1)	84.6 (83.2;86.1)
100.001 to 300.000	1,648 (15.0)	39.6 (36.4;42.9)	34.2 (30.7;37.7)	37.2 (34.9;39.6)	92.7 (91.0;94.4)	93.1 (91.2;94.9)	92.8 (91.6;94.1)
More than 300.000	3,122 (28.4)	43.0 (40.8;45.3)	42.5 (39.6;45.4)	42.9 (41.1;44.6)	95.1 (94.2;96.1)	92.7 (91.2;94.2)	94.2 (93.4;95.1)
HDI[f]							
0.467 to 0.642	1,504 (13.7)	35.1 (31.6;38.6)	22.9 (19.8;25.9)	28.9 (26.6;31.2)	81.6 (78.8;84.4)	72.4 (69.2;75.5)	76.9 (74.7;79.0)
0,643 to 0,730	2,159 (19.6)	37.3 (34.6;40.1)	30.3 (27.3;33.3)	34.2 (32.2;36.3)	82.2 (80.0;84.3)	80.5 (78.0;83.0)	81.4 (79.8;83.1)
0,731 to 0,787	2,721 (24.8)	35.4 (32.9;37.9)	27.4 (24.8;30.0)	31.9 (30.1;33.7)	89.4 (87.9;91.0)	85.3 (83.3;87.3)	87.6 (86.3;88.8)
0,788 to 0,919	4,601 (41.9)	40.0 (38.2;41.7)	39.2 (36.7;41.6)	39.7 (38.2;41.1)	94.7 (93.9;95.5)	94.8 (93.7;95.9)	94.7 (94.1;95.4)

a) PMAQ: Program for Improving Primary Health Care Access and Quality; b) Adequate team organization: educational group for NCDs + prescription refill + test results + reported in the territory + active search + risk stratification; c) Adequate request for tests: creatinine + electrocardiogram + glycosylated hemoglobin + lipid profile; d) Number of health teams may vary according to *n* of the independent variables (region, population size and HDI-M); e) 95%CI: 95% confidence interval; f) HDI: human development index.

users had undergone creatinine, lipid profile and electrocardiogram tests in the last six months, and only three out of ten had their feet examined by a health professional in the last six months.

Foot examination has proved to be one of the most problematic health care indicators, because it has presented low prevalence over time, both in Brazil[16,23] and abroad.[18,24] A study by Tomasi et al.[16] on data from PMAQ cycle I, conducted in 2012, showed that the prevalence of foot examinations performed was 33%, as reported by primary health care users. Another study,[23] with a national sample of elderly people with DM, conducted in 2009, showed that the prevalence of foot examination was 37%. This finding is in line with the international literature, which shows the prevalence of foot examination from 15 to 60% in countries in Europe and North America.[18,24,25]

The teams with the highest prevalence of adequate organization and adequate request for tests were located in the largest municipalities in the Southeast and South regions, with the highest HDI. This result was similar to that of other studies,[16,26,27] possibly because they are the richest municipalities, with a greater investment in structure and continuing education for health professionals, contributing factors for a work process of the best quality teams. When it comes to territorial geopolitics, the country's regional inequalities stand out, with the worst results for the North and Northeast regions.[16,27,28]

Service users with complete higher education had a 2.4 fold higher prevalence of adequate health care when compared to those who cannot read and write. The result corroborates the findings of other studies,[17,23] as it evidences inequities and once again, the presence of the 'inverse care law', given that a good quality

Table 3 – Prevalence and confidence intervals of adequate team organization and adequate request for tests, related to health care for people with diabetes and hypertension, according to the characteristics of the municipalities, stratified by team participating in PMAQ cycles,[a] Brazil, 2014

Variables	Number of sevice users (%)[c]	Adequate health care reported by service users[b]		
		Cycles I e II	Only Cycle II	Total sample
		% (IC95%)[d]	% (IC95%)[d]	% (IC95%)[d]
Regions of the country				
North	487 (4.4)	11.1 (6.5;15.7)	6.3 (3.2;9.4)	8.3 (5.7;11.0)
Northeast	2,602 (23.6)	12.8 (10.8;14.7)	12.1 (10.1;14.1)	12.5 (11.1;13.9)
Mid-West	1,008 (9.1)	13.1 (9.8;16.3)	15.8 (12.1;19.5)	14.4 (11.9;16.9)
Southeast	5,232 (47.5)	22.2 (20.6;23.7)	21.5 (19.4;23.5)	21.9 (20.6;23.1)
South	1,700 (15.4)	18.0 (15.4;20.5)	17.8 (14.1;21.6)	18.0 (15.9;20.0)
Population size (inhab.)				
Up to 10.000	1,293 (11.7)	17.8 (14.8;20.9)	20.9 (16.9;25.0)	18.9 (16.5;21.3)
10.001 to 30.000	2,608 (23.7)	14.6 (12.6;16.7)	14.0 (11.7;16.3)	14.3 (12.8;15.8)
30.001 to 100.000	2,347 (21.3)	16.7 (14.5;19.0)	16.2 (13.7;18.8)	16.5 (14.8;18.2)
100.001 to 300.000	1,655 (15.0)	19.5 (16.7;22.4)	15.3 (12.4;18.3)	17.6 (15.6;19.7)
More than 300.000	3,126 (28.3)	22.0 (19.9;24.0)	19.1 (16.6;21.6)	20.9 (19.3;22.5)
HDI[e]				
0.467 to 0.642	1,510 (13.7)	13.3 (10.6;16.1)	11.2 (8.7;13.6)	12.2 (10.4;14.0)
0.643 to 0.730	2,173 (19.7)	15.5 (13.2;17.7)	14.7 (12.2; 17.2)	15.1 (13.4;16.8)
0.731 to 0.787	2,737 (24.8)	15.8 (13.7;17.8)	14.4 (12.2;16.6)	15.1 (13.6;16.6)
0.788 to 0.919	4,609 (41.8)	22.1 (20.4;23.7)	22.9 (20.5;25.2)	22.4 (21.0;23.7)
Sex				
Male	3,155 (27.5)	22.0 (19.9;24.1)	20.5 (18.1;23.0)	21.3 (19.7;22.9)
Female	8,340 (72.5)	17.0 (15.8;18.2)	15.4 (14.1;16.7)	16.3 (15.4;17.2)
Age (years)				
18-39	481 (4.2)	19.3 (13.9;24.6)	12.4 (7.0;17.8)	16.3 (12.5;20.1)
40-59	4,556 (39.6)	17.8 (16.2;19.5)	15.8 (14.0;17.6)	17.0 (15.8;18.2)
60 or older	6,458 (56.2)	18.8 (17.3;20.2)	17.8 (16.1;19.4)	18.3 (17.2;19.4)
Race/skin color				
White	4,513 (40.2)	20.3 (18.6;22.0)	19.5 (17.5;21.5)	19.9 (18.6;21.2)
Black	1,688 (15.0)	20.1 (17.3;22.9)	16.4 (13.3;19.4)	18.6 (16.5;20.6)
Brown	4,631 (41.2)	17.0 (15.3;18.6)	14.8 (13.1;16.5)	16.0 (14.8;17.1)
Asian/indigenous	407 (3.6)	12.0 (7.4;16.7)	15.8 (9.8;21.7)	13.7 (1.00;17.3)
Schooling				
Cannot read/write	1,744 (15.2)	14.5 (12.0;17.0)	11.9 (9.3;14.4)	13.4 (11.6;15.2)
Incomplete elementary school	6,596 (57.5)	18.0 (16.6;19.3)	17.0 (15.4;18.5)	17.5 (16.5;18.5)
Complete elementary school	1,702 (14.8)	16.8 (14.1;19.4)	16.8 (13.7;19.8)	16.7 (14.7;18.6)
Complete high school	1,212 (10.6)	26.0 (22.4;29.7)	21.1 (17.2;25.1)	24.0 (21.3;26.7)
Complete higher education	217 (1.9)	34.0 (24.3;43.8)	30.0 (19.0;41.0)	32.3 (25.1;39.6)

a) PMAQ: Program for Improving Primary Health Care Access and Quality; b) Adequate health care reported by service users: blood pressure measurement + creatinine + electrocardiogram + foot examination + fasting blood glucose + lipid profile; c) The number of service users may vary according to *n* of the independent variables (region, population size, HDI-M, gender, age, race/skin color and schooling); d) 95%CI: 95% confidence interval; e) HDI: human development index.

of health care is directly associated with a higher socioeconomic level. Similarly, schooling seems to be an important determining factor, either (i) directly associated with receiving good quality health care,[17,23] or (ii) inversely associated with the occurrence of isolated NCDs[1] and/or multimorbidity.[29] This counterpoint is an important indication of iniquity: however, people with a higher prevalence of the disease receive the worst health care.

The best results of the teams that took part in cycles I and II, may be due to the self-assessment process, demanded by the program in one of its phases, and this assessment can have occurred twice for the teams that took part in both cycles. This double exposure to PMAQ requirements may have contributed to the improvement of the indicators observed, thus health professionals were motivated to improve their work process, given that the three instruments of the program aimed to investigate practices and indicators recommended by the Ministry of Health for good quality of health care.

Moreover, it is worth remembering that the municipalities received financial incentive from the program, therefore, it was required that they had positive evaluations according to the performance of participating primary care teams. Regardless of the destination given to these resources by different municipal governments, this incentive was made doubly available to those who took part in PMAQ in 2012 and 2014.

Another relevant factor for the findings was that the PMAQ was the only intervention focused on the improvement of Primary Health Care of the SUS, performed during this period. Inspired by other countries' experiences that use financial resource transfer according to the performance, the PMAQ encourages the promotion of quality of health care service provided.[30]

The limitations of this study include a possible selection bias, given that the team adherence to PMAQ is voluntary. Although there was a great number of team adherence to cycle II, with the inclusion of teams from all over the country – more than 70% of the PHCCs took part – caution should be exercised in extrapolating the results of this study to all teams in the country. Health care for people with diabetes and hypertension in Brazil may be even more precarious than that showed in this study, if we take into consideration that teams in poorer working conditions may not have taken part in the program.

In order to evaluate the work process, some variables such as 'work organization' and 'request for tests by health teams' were used as proxy. It is known that evaluation of the work process of health professionals is much more complex, although the approach adopted in this research required the availability of these variables in the instruments used.

It is important to highlight that this is an unprecedented study, conducted in the Primary Health Care of the Brazilian National Health System, with a large sample of people with diabetes and hypertension and health teams responsible for their care, all over the country. This theme, still incipient in the literature, and the findings of the study may encourage further investigations on this context, in addition to contributing to a national perspective on the quality of health care for the population.

It is also worth remembering that, if there is evidence about each NCD alone, we should take into consideration the lack of knowledge about the condition of these diseases, when grouped, and the action in the lines of care focusing on multimorbidity. There were no specific instruments and indicators established to evaluate the health care for this population, until the moment of this publication.

In Brazil, health care for people with DM and SAH in the primary health care needs improvement. Foot examination carried out in the last six months and the request for electrocardiogram, lipid profile and creatinine tests should be better handled by health professionals, during the follow-up of the person with diabetes *mellitus* and systemic arterial hypertension. Given the growing presence of people with two or more morbidities, health services and professionals should be prepared to meet this demand in a qualified manner. Future studies will be useful to evaluate the quality of health care by comparison groups, such as users with and without multimorbidity.

The continuity of PMAQ should be supported, and researches, using the data of its cycles I, II and III, performed in order to evaluate finding consistency and the effectiveness of the program over time, considering a longer period and a greater number of evaluations.

Authors' contribution

Neves RG, Duro SMS and Tomasi E collaborated with the conception and design of the study, analysis and interpretation of the results, drafting and critical reviewing of the manuscript. Nunes BP and Facchini LA collaborated with data analysis and interpretation, drafting and critical reviewing of the manuscript content. All authors have approved the final version of the manuscript and have declared themselves to be responsible for all aspects of the work, including ensuring its accuracy and integrity.

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