

Frequency of Stroke and Cardiovascular Events in Diabetic and Hypertensive Patients - Follow up 15 years

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Abstract

Background: Considered to be a modern epidemic, Chronic Non-Communicable Diseases (CNCD) (systemic hypertension, diabetes mellitus or hypertension/diabetes) are serious public health problems.

Objective: To evaluate the frequency of stroke and acute myocardial infarction in patients with type II diabetes, systemic arterial hypertension or both diseases.

Methods: This is a longitudinal study that assessed the incidence of stroke and cardiovascular events within the previous 15 years in patients with DM or SHB. consultations were held annually by the health teams at the primary healthcare units, gender, age, race and education, presence of DM, SHB, family history, smoking and alcohol, sedentary lifestyle overweight or obese control of disease was done. In addition, presence of clinical complications, such as acute myocardial infarction and other coronary disease, stroke and hypertensive crisis and diabetes exacerbation were collected.

Results: Initially 986 patients were elected to participate in the study, 562 dropped out, the 424 patients were divided into three groups according to the diagnosis, hypertension, diabetes and the association of both diseases. During follow-up, 104 events of hypertensive crisis or diabetes exacerbation and 54 strokes or acute myocardial infarction were recorded; however, 267 patients did not experience any of these events during follow-up.

Conclusion: The frequency of hypertensive crises and diabetes exacerbation was 6.9 while stroke and acute myocardial infarction was 3.6 per year. Patients with an association of the two diseases presented a higher propensity of events, as well as those who did not have weight control and did not fully control the disease.

1. Introduction

Considered to be a modern epidemic, Chronic Non-Communicable Diseases (systemic hypertension, diabetes mellitus or hypertension/diabetes) are serious public health problems, in wealthy countries and in those of moderate and low prosperity. Treatment for these diseases is costly and may compromise public health resources in many countries [1]. In 2017, approximately 35 million people died of chronic diseases in the world, which represents double the number of deaths compared to infectious diseases [2].

The main events found among patients with diabetes and hypertension or the association of both diseases are hypertensive crises, diabetes exacerbation, acute myocardial infarction and stroke [3]. The crude incidence of stroke was 1,000 per 100,000 in the diabetic men v/s 247 in the non-diabetic men (Relative risk 4.1; 95% Confidence Interval (3.2-5.2)). Among diabetic women, the crude incidence was 757 per 100,000 and 152 in non-diabetic women (relative risk 5.8; 95% confidence interval (3.7-6.9)) [4].

Cardiovascular disease (CVD) is a major cause of death and disability among people with diabetes systemic hypertension, diabetes mellitus or hypertension/diabetes [5]. In persons with diabetes mellitus, the death rates were 15.4% for those with no prior Myocardial Infarction (MI) and 42.0% in patients having a history of Myocardial Infarction. In contrast, patients who did not have diabetes mellitus, the death rates due to cardiovascular causes were 2.1% and 15.9%, respectively [6].

The possible association between arterial hypertension and diabetes mellitus is approximately 50%, causing high cardio-cerebrovascular morbidity [7]. It is possible that patients with hypertension and diabetes or the association of the two diseases accompanied by public health services have lower rates of stroke, acute myocardial infarction, and hypertensive crisis and diabetes exacerbation. Therefore, the aim of this study was to evaluate the frequency of stroke and acute myocardial infarction in patients with type II diabetes, systemic arterial hypertension or both diseases.

2. Methods

This is a descriptive and longitudinal study that assessed the incidence of stroke and cardiovascular events within the previous 15 years in patients with systemic hypertension or diabetes or association two conditions. They took part in this study patients attended by the family health program with hypertension and diabetes or associated two conditions. It was included subjects were hypertensive patients that were classified according to the Brazilian Hypertension Guidelines, e.g., systolic pressure over 130 mmHg and diastolic pressure over 90 mmHg, age over 30 years old, being diagnosed of SAH or DM with higher fasting glucose than 126 mg/dl. The protocol was approved by the local Ethics Committee and all patients signed an informed consent form.

Indication data, month and year of the consultation with the health teams at the primary healthcare units, sociodemographic characters (gender, age, race and education), presence of arterial hypertension, diabetes type 1 or type 2, and related/associated factors when one or both of these diseases are present, including family history, smoking and amount/frequency, sedentary lifestyle and whether the individual is overweight or obese. The parameters set for weight consider the body mass index (BMI), with classification as follows: normal (18.5-24.9 kg/m²), overweight (25-29.9 kg/m²), obese class I (30 to 34.9 kg/m²), obese class II (35 to 39.9 kg/m²) and obese class III (> 40 kg/m²). In addition to the variables

already described, one must add the presence of clinical complications, such as acute myocardial infarction and other coronary disease, cerebral vascular accident and hypertensive crisis and diabetes exacerbation were collected.

Did not participate in the study individuals who in addition to diabetes and hypertension conditions were associated cancer, autoimmune diseases, COPD established chronic kidney disease. The following parameters were used for the calculation of the sample size: prevalence of systemic hypertension of 28%, and 8% diabetes 95% CI, and acceptable error of 5%, thus giving a total of 389 patients.

The instruments used for data collection comprised a structured questionnaire including questions regarding the socioeconomic identification according to the Brazil Economic Classification Criterion (BECC) [8]; awareness about health care measures; risk factors such as cigarette smoking and sedentary lifestyle; family history; presence of DM; perception of the disease; and treatment adherence as assessed by the Morisky test [9]. Stroke, acute myocardial infarction, hypertensive crisis, diabetes exacerbation. The data were collected annually when these patients performed in nursing consultation, doctor or in physical rehabilitation groups. The instrument was administered by trained interviewers, nurses or nursing technicians [10].

The Individual Lifestyle Profile (PEVI) questionnaire which is an instrument for measuring lifestyle based on the components "Nutrition", "Physical activity", "Preventive behaviour", "Social relations" and "Stress control". It is a self-administered tool that considers the behaviour of individuals in the previous year and whose results allow to determine the association between lifestyle and health. The questionnaire has 15 questions, for each question there is a possibility of zero to three points, for each of the domains up to nine points, and for total score of the instrument up to forty-five points. With a score of up to 16 points, the individual is classified with a negative lifestyle and requires change. Score between 16 and 30 points is compatible with a reasonable lifestyle, and above 30 points subjects are considered to have a good lifestyle.

Questionnaire and Morisky Green Test to evaluate medication adherence. It consists of four questions related to the use of medication, for which it is possible to indicate the answer yes or no. According to application instructions, if there is at least one affirmative answer to any of these questions, the respondent will be considered as non-adherent to the use of medication.

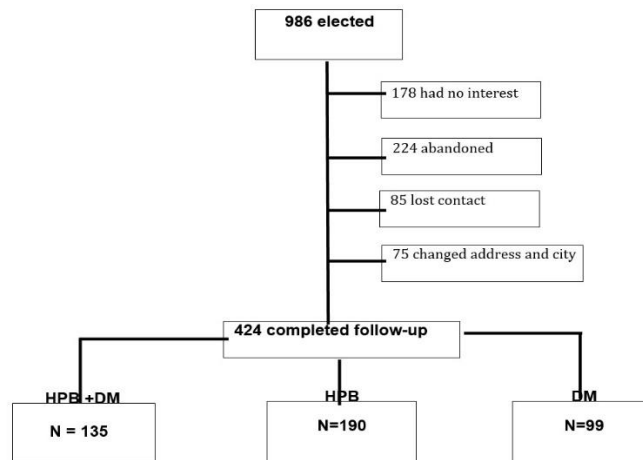
3. Statistical Analysis

The Kolmogorov-Smirnov normality test was used to evaluate the distribution of data in relation to normality. Data are presented as mean and standard deviation, or in proportion. The comparison of the groups was performed by the variance analysis test. Data are presented as mean and standard deviation, or in proportion. The comparison of the groups was performed by the variance analysis test. To evaluate the portions, the chi-square test was used. The proportion of events over time was analysed using the Kaplan Maier. Considered $p < 0.05$ as statistical significance.

4. Results

Initially 986 patients were elected to participate in the study, 562 dropped out at some point in the study (as shown in Design).

Designer of Study



The 424 patients were divided into three groups according to the diagnosis, hypertension, diabetes and the association of both diseases. In the TABLE 1, the groups were matched Demographics, body composition, smoking history and alcohol history, disease control, lifestyle habits, family background, physical and self-perception of health. Women predominated in all groups. When compared with subjects in the group of hypertension and diabetes associated, there was a higher proportion that has a worse self-perception of their health.

TABLE 1. Demographics, Body Composition, Smoking History and Alcohol History, Disease Control, Lifestyle Habits, Family Background, Physical and Self-Perception of Health.

Variables (N=135)	HPB+DM	HPB (N=190)	DM (N=90)	p
Age (Years)	60.3 ± 12.3	58.3 ± 11.3	62.3 ± 9.1	ns
Gender (M/F)	60/40	55/45	65/34	ns
BMI (kg/m ²)	29.3 ± 5.3	27.3 ± 4.1	29.9 ± 8.2	ns
Smoker (%)	13	11	12	
Alcoholic (%)	16	15	15	
Controlled Diabetes (%)	11	-	16	
Controlled HBP (%)	38	33	-	
Hypertensive Family Background (%)	24	21		24
Diabetes Family Background (%)	12	15	19	
Life Style (PEVI)	28.1 ± 4.5	29.2 ± 5.5	31.5 ± 3.2	
Better (%)	12	18	15	ns
Same (%)	43*	65	58	0.007
Worse (%)	45*	17	27	0.004

*p=0.008 DM versus HPB

TABLE 2. Absolute and Proportion Distribution of Events by Group.

Events	HPB + DN (N=135)	HPB (N=190)	DM (N=99)
Acute Myocardial Infarction (%)	10(6)	5(4)	10 (10.1)
Stroke (%)	12(13.5)	9(5.7)	8(8.1)
Hypertensive Crisis (%)	23(18.5)	23(11)	4(4)
Diabetes Worsening (%)	33(25.9)*	2	19(19.3)*

*p=0.008 DM

Versus HPB

*p=0.008 DM low then HPB

During follow-up, 104 events of hypertensive crisis or diabetes exacerbation and 54 stroke or acute myocardial infarction were recorded, however 267 patients did not experience any of these events during follow-up. Age, sex and body composition BMI data were similar for the groups, as were the proportion of smokers who control blood pressure, and family history of hypertension and diabetes. The groups with disease association had a higher proportion of alcoholics, a lower proportion of patients controlling diabetes, and a worse lifestyle (TABLE 3).

TABLE 3. Demographics, Body Composition, Smoking History and Alcohol History, Disease Control, Lifestyle Habits, Family Background, Physical and Self-Perception of Health Depending on the Type of Event.

Variables	Hypertensive Crisis Diabetes Worsening (N=104)	Events (Stroke Acute Myocardial Infarction) (N=54)	No events (N=267)	p
Age (Years)	61.2 ± 13.2	59.1 ± 12.3	60.4 ± 12.1	
Gender (M/F)	64/40	25/29	175/91	
BMI (kg/m ²)	29.6 ± 5.7	28.6 ± 5.1	28.9 ± 5.7	
Smoker (%)	12	19	15.3	
Alcoholic (%)	21	19	13.7*	0.04
Controlled Diabetes (%)	10	12	19*	0.03
Controlled HBP (%)	42.5	46.3	64.8*	
Hypertensive Family Background (%)	73.4	74.2	74.2	
Diabetes Family Background (%)	51.3	49.5	49.8	
Life Style (PEVI)	25.3 ± 4.3	25.2 ± 4.5	32.5 ± 4.9*	0.025
Better (%)	42.4	36.7	45	
Same (%)	30	25	45*	0.034
Worse (%)	18	14.1	10	

* P<0.05 Non-events in relation all groups

TABLE 4 shows the proportion of events by body composition. There was a higher proportion of patients in the non-events group with normal weight or overweight, for stroke and AMI there was a higher proportion of patients with obesity III compared to normal weight, as well as for hypertensive crises and diabetes exacerbation a higher proportion of patients with obesity I and II than normal weight.

TABLE 4. Classification according to basal BMI.

Interval	Classification	Global (N=424)	Hypertensive Crisis Diabetes Worsening (N=104)	Events (Stroke Acute Myocardial Infarction) (N=54)	No Events (N=267)
<18	Under Weight	1(0.24)	1(1.0)	(0)	(0)
Between 18.5 and 24.99	Normal Weight	106(25.0)	15 (14.4)€	9(16.7)**	82(30.8)
Between 25 and 29.99	Overweight	160(37.74)	30(28.8)	15(27.8)	115(43.2)
Between 30 and 34.99	Obesity I	104(24.53)	38(36.5)	13(24.1)	53(19.9)&
Between 35 and 39.99	Obesity II (Severe)	34(8.02)	17(16.3)	17(31.5)	(0)
Over 40	Obesity III (Morbid)	19(4.48)	2(1.9)	(0)	17(6.4) *

*p=0.0023 Normal weight and overweight versus obesity II (No events)

& p= 0.001 Normal weight and overweight versus obesity III (No events)

**P<0.05 Normal weight versus obesity II and III (stroke and AMI)

€ P<0.05 Normal weight versus obesity I and II

FIG. 1 shows the proportion of stroke acute myocardial infarction for the three groups, Diabetes-associated hypertension, high blood pressure, and type II diabetes over follow-up. The highest proportion of events was for the groups that had associated two diseases (17.3%), followed for the hypertension group (14.2%).

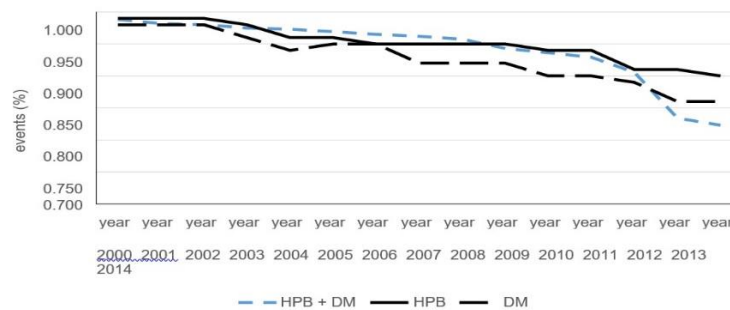


FIG. 1. Events recorded (stroke acute myocardial infarction) for the three groups.

FIG. 2 shows the proportion of fatal events (stroke acute myocardial infarction) for the three groups. Diabetes-associated hypertension, high blood pressure, and type II diabetes over follow-up. The highest proportion of events was for the groups that had associated two diseases (4.3%), followed for the diabetes group (3.0%).

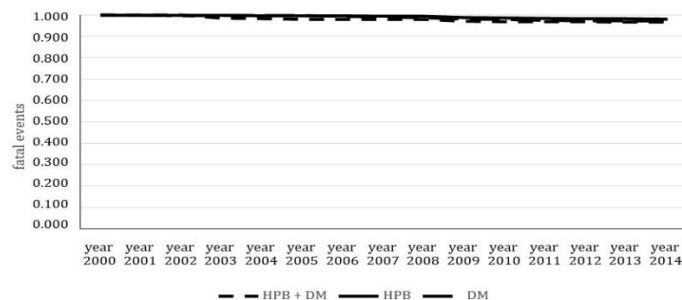


FIG. 2. Fatal events (stroke acute myocardial infarction) or recorded for the three groups.

5. Discussion

The main objective of this study was to evaluate the frequency of stroke and acute myocardial infarction in patients with type II diabetes, systemic arterial hypertension or both diseases. There are a higher proportion of events among patients with an association of both diseases. There was a higher proportion of normal weight and control the diseases individuals in the group without events, and a higher proportion between obesity and events. The basal lifestyle was worse for the group with associated diseases as well as for event and non-event.

In this study, a higher proportion of stroke and acute myocardial infarction was found among individuals with diabetes II and hypertension. Although diabetes and hypertension is a strong risk factor for stroke, it is still unsettled whether stroke is different in patients with and without diabetes or hypertension. This is true for stroke type, stroke severity, the prognosis, and the relation between admission glucose blood pressure levels and stroke severity/mortality [11]. Diabetes and blood pressure influences stroke in several aspects: in age, in subtype, in speed of recovery, and in mortality. Increased glucose levels on admission independently increase mortality from stroke in non-diabetic but not in diabetic patients [12].

Arterial hypertension and diabetes II are no treatable but manageable diseases, it is possible that most of these stroke patients did not have a fully controlled disease. Studies have shown that these diseases are silent, and often due to the absence of significant symptoms, patients stop using the medication and abstain from a healthy lifestyle. SAH, and DM are considered “silent killer”, is the biggest social problem of developed and many emerging countries [13].

Even though the effectiveness and effectiveness of various preventive and control measures available, pharmacological or not, hypertension will continue for decades to represent one of the major health challenges and one of the greatest burdens on the hypertensive person and society [14-16]. If the control of existing cases, as well as the control and prevention of risk factors of this disease are not implemented, this problem will affect large proportion of the world's population, which will increase by 2020 of people over 60 [17,18]. Stroke is basically due to obstruction of some cerebral artery or even extravasation of the artery into the interstitial areas of the brain [19].

In a study with analysis of medical records of patients with elevated diastolic blood pressure levels ≥ 120 mmHg and symptomatic, treated in emergency room of a university hospital during 12 months. The hypertensive crisis accounted for

0.5% of all consultations. Ischemic Stroke and edema acute lung disease was the most frequent target organ injury in hypertensive emergencies [20]. These authors show that disease control is essential to prevent the emergence.

Studies have showed that smoking control, serum cholesterol control, alcohol control, diabetes control, obesity control and physical activity are potential factors to reduce cerebrovascular events and mortality in hypertensive patients. Another consideration is the support given by the FHP staff for the stroke mortality decrease. Some studies have suggested that most stroke deaths are taking place other than in medical centers leading to swifts in their health behavior [21,22].

It was also seen that smokers and subjects who did not have their disease fully controlled have an increased risk for cerebrovascular event development. One study with 500 enrolled hypertensive patients showed that smoking subjects have a higher chance to develop acute myocardial infarction (OR=5.86; CI 95%, 3.25 to 10.57) [23]. Effects of smoking habits have been investigated in scattered populations. One study showed a strong association between smoking habits and coronary artery disease in major Brazilian cities [24]. Another hospital based study assessed risk factors for acute myocardial infarction and out of the polled variables tested the most important one was current smoking (OR=3.6) [25].

Patients who stopped treatment had three times greater risk of acute myocardial infarction than those who continued treatment. Another hand smoking cessation, treatment of hypertension, and reduction in blood glucose and central obesity (perhaps through dietary modification) may be important in preventing ischaemic heart disease [26]. Lessa et al. [27] proposes that the lack of adherence to treatment may be assessed by the amount of strokes and deaths occurs.

According to Calhoun et al., [28] the low treatment adherence is frequently seen in the primary attention level rather than in specialized medical care services. Another study showed that patients who do not control their blood pressure may present 3.5 times greater risk of brain and cardiovascular events development [25].

The clinical implications of this study are related to fact that prevention measures, risk factors control and identification may be implemented, mainly disease control verification and non-pharmacological treatment implementations. Our study's limitations are applied to the fact that correct use of prescribed medications as well as the associated comorbidities was not fully monitored.

6. Conclusion

The frequency of hypertensive crises and diabetes exacerbation was 6.9 while stroke and acute myocardial infarction was 3.6 per year. Patients with an association of the two diseases presented a higher propensity of events, as well as those who did not have weight control and did not fully control the disease.

Conflict of Interest: None

Funding: None

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