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Prevalence of hospital admissions due to diabetes mellitus in Brazil between 2020 and 2023

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ABSTRACT
Diabetes mellitus (DM) is characterized as a non-transmissible chronic disease and is considered a public health problem for all countries, regardless of their degree of development. The evolution of DM results in macrovascular complications such as systemic arterial heart disease, stroke, peripheral arterial disease, and microvascular causes such as retinopathy, nephropathy, and neuropathy. This is a descriptive, ecological, and quantitative study on hospitalization for diabetes mellitus from January 2020 to May 2023 (last month with data available in the system at the time of consultation). Data regarding hospitalizations, deaths, gender (male and female), age group, average length of stay and hospital costs were collected from the Hospital Information System of the Unified Health System (SIH/SUS). The tabulation and descriptive analysis of the data were inserted in the Microsoft Office Excel program. There were 445,416 hospital admissions and 19,998 deaths from DM. In addition, hospital costs above 351 million and an average hospital stay of 7.12 days stood out. It was found that information on the number of hospitalizations, hospital costs and deaths is suffering a significant increase every year because of complications from DM, causing significant impacts on public coffers.

Keywords: Hospitalization, Diabetes Mellitus, Chronic disease, Hospital Morbidity.

1 INTRODUCTION

Diabetes mellitus (DM) is characterized as a chronic non-communicable disease and is considered a public health problem for all countries, regardless of their degree of development. According to the Brazilian Society of Diabetes (SBD), about 8.8% of the world's population lives with the disease and it is expected that by 2045 the number of diabetics will increase to more than 628.6 million people worldwide[1].

The cause of diabetes is multifactorial, being related to genetic and environmental factors, nutrition transition, sedentary lifestyle, overweight, population aging, among others. The disease

arises as a result of alterations in the production of insulin by the pancreas and/or resistance to perform its function correctly in the body[2]. The diagnosis of DM is made by identifying hyperglycemia. For this purpose, laboratory tests such as fasting plasma glucose, oral glucose tolerance test, and glycated hemoglobin (HbA1c) can be used. The values for diagnostic criteria are: fasting plasma glucose ≥ 126mg/dl, blood glucose two hours after an overload of 75g of glucose ≥200mg/dl or HbA1c ≥ 6.5%[1]. The HbA1c test becomes more reliable in the detection of DM because it reflects the average glucose concentration in the last 90 days, unlike fasting glucose and the oral glucose tolerance test, which manifest specific moments. It is necessary to have an alteration in two tests to confirm the presence of the disease[3].

The progression of DM results in macrovascular complications, such as systemic artery heart disease, stroke, peripheral arterial disease, and microvascular causes such as retinopathy, nephropathy, and neuropathy[2].

Another frequent complication resulting from the disease is diabetic foot, characterized by infections and ulcers, and is the main cause for amputations. The removal of a limb leads to biopsychosocial changes, causing anguish, distancing from work activities, loss of function and high costs for treatment and rehabilitation services[4].

In his study, Palasson[5] states that there is a 70% difference in health care costs when compared to individuals with and without diabetes. He adds that this increase can be justified by the high rate of hospitalizations and medications, which can make up half of the expenses with health expenditures directed to this disease.

The DM patient suffers from chronic hyperglycemia, due to the deficiency of the hormone that distributes glucose to the body tissues and the subsequent physiological use of glucose for energy generation, being a condition that affects the metabolism of macronutrients[6]. The treatment of diabetes mellitus consists of insulin therapy, antidiabetic drugs and, mainly, glycemic control. Thus, diabetes is a disease in which new habits and behavioral changes are essential, requiring greater knowledge, development of skills, welcoming and support from the health team.

Therefore, considering the incidence of DM cases and their health problems, this study aims to verify the number of hospitalizations and deaths due to diabetes mellitus in Brazil between 2020 and 2023.

2 METHODOLOGY

This is a descriptive, ecological, and quantitative study on hospitalization for diabetes mellitus from January 2020 to May 2023 (the last month with data available in the system at the time of consultation). A survey of secondary data was carried out, obtained from the Hospital Information System of the Unified Health System (SIH/SUS) of the Department of Informatics of the Unified

Health System (DATASUS), on the health information platform (TABNET) – data tabulator (https://datasus.saude.gov.br/acesso-a-informacao/morbidade-hospitalar-do-sus-sih-sus/).

The five Brazilian regions were selected as the study setting: North, Northeast, Southeast, South and Midwest. The variables chosen to categorize the study were: hospitalizations, deaths, gender (male and female), age group, mean length of stay, and hospital costs.

The tabulation and descriptive analysis of the data were entered into the Microsoft Office Excel program (Microsoft©, 2013) and took place in the same month of data collection, in July 2023. As these are secondary data and in the public domain, there was no need to submit them to the Research Ethics Committee, in accordance with Resolution No. 466/2012 of the National Health Council.

3 RESULTS AND DISCUSSION

The current epidemiological scenario in Brazil has the prevalence of chronic non-communicable diseases, such as obesity, hypertension and diabetes mellitus. This increase has been impacted by the accelerated demographic and nutritional transition[7]. According to the Diabetes Atlas of the International Diabetes Federation (IDF), Brazil ranks 5th Among the countries with the highest incidence of diabetes, there are about 16.8 million adult patients[8].

The illness of the Brazilian population due to DM does not only imply financial costs, but also countless costs for the individual and their families, such as pain and suffering. Properly measuring the extent of this disease means a chance to improve health surveillance actions, in addition to reviewing the quality and adequacy of interventions already carried out[5] .

According to Table 1, there were 445,416 hospital admissions due to DM, accounting for 1.12% of all hospitalizations in Brazil. It is noteworthy that the Southeast region had the highest results, with 36.7% (n=163,491). It is inferred that these results may be a reflection of the larger population contingent observed in this region. This was followed by the Northeast region, with 31.95% (n=142,340). On the other hand, the Central-West region has the lowest rate of hospitalization due to DM, representing only 6.8%.

Table 1- Hospitalization due to DM by region from January 2020 to May 2023.

Region	2020	2021	2022	2023	Total	%
North Region	12.369	13.768	15.389	6.074	47.600	10,68
Northeast Region	38.988	41.992	43.950	17.410	142.340	31,95
Southeast Region	46.644	46.310	49.937	20.600	163.491	36,7
South Region	17.952	17.411	18.489	7.583	61.435	13,79
Midwest Region	8.693	8.607	9.477	3.773	30.550	6,8
Total	124.646	128.088	137.242	55.440	445.416	100

Source: Ministry of Health - SUS Hospital Information System (SIH/SUS)

Table 2 shows that the number of deaths due to DM registered totaled 19,998 cases. In addition, it is possible to observe that only the first five months of 2023 are equivalent to 36% (n=2,154) of the total number of deaths that occurred in 2020 (n=5,862). The annual average of deaths for the period studied is 4,999 deaths. During the years 2020 to 2022, there was an average growth of 147 deaths/year.

The aging of the Brazilian population and the increase in the prevalence of DM are some of the factors that can lead to an increase in the number of hospitalizations and mortality. It is important to emphasize that factors such as a sedentary lifestyle, a diet based on ultra-processed foods, excessively composed of trans and saturated fats, increased consumption of refined carbohydrates and sodium, smoking and alcohol abuse, can contribute to the onset of diabetes and, consequently, to deaths[9,10].

Table 2- Deaths due to DM by region from January 2020 to May 2023.

Region	2020	2021	2022	2023	Total	%
North Region	590	651	566	214	2.021	10,1
Northeast Region	2.016	1.849	2.073	738	6.676	33,38
Southeast Region	2.270	2.378	2.220	814	7.682	38,41
South Region	675	827	763	277	2.542	12,71
Midwest Region	311	341	314	111	1.077	5,38
Total	5.862	6.046	5.936	2.154	19.998	100

Source: Ministry of Health - SUS Hospital Information System (SIH/SUS)

Table 3 shows intervals between 5.3 and 7.6 days of hospitalization in relation to the mean length of stay, showing an average of 6.4 days of hospitalization due to DM. Selecting this variable by region, it is noted that the Northeast had the highest average length of stay in the period studied, with about 7.12 days. The southern region, on the other hand, shows the lowest average length of stay, with approximately 5.5 days.

The concentration of people living in poverty in the Northeast is the highest among the five regions of the country, and its residents are likely to die during hospitalization. This would be justified by the difficulty in obtaining medications, delays in carrying out tests and the low rate of early diagnosis of the disease[11].

DM is a disease that requires changes in lifestyle, changes in diet and increased frequency of physical activities, but non-adherence to these changes can trigger an increase in glucose levels in the bloodstream[12]. Decompensation of diabetes can lead to clinical complications, which are the main cause of hospitalization. Another factor that favors the longer hospital stay is the high number of patients undergoing surgical procedures, who have a higher occurrence of postoperative infections and longer stays with a central venous catheter[13].

Table 3- Average length of stay by DM according to region from January 2020 to May 2023.

Region	2020	2021	2022	2023	Total
North Region	6,5	6,9	7,1	7,6	6,9
Northeast Region	7	7	7,1	7,4	7,1
Southeast Region	6,3	6,3	6,7	6,8	6,5
South Region	5,3	5,5	5,7	5,5	5,5
Midwest Region	5,9	5,8	6,4	6,5	6,1
Total	6,3	6,4	6,7	6,9	6,5

Source: Ministry of Health - SUS Hospital Information System (SIH/SUS)

Table 4 shows that the highest prevalence of hospitalizations occurred with people aged 60 to 69 years, 24.42% (n=108,776), followed by the 50-59 age group, 19% (n=86,888). Thus, it is possible to observe that DM presents an increasing trend of morbidity according to age.

Because it is an indiscriminate disease, DM affects individuals of all races, sex, age and social status, but the elderly suffer from a greater predisposition to chronic non-communicable diseases (NCDs), which affects the quality of life of the elderly, and can progress to death[9]. The aging of the Brazilian population is increasing, where the number of people over 60 years of age is increasing, and this age group is an independent risk factor for diabetic complications[14]. This aging modifies the main physiological systems of the body, in this way, the elderly are considered as a fragile group and prone to impairment of physical and functional capacity[15]. With advancing age, there is an immunological fragility, thus favoring the risk of complications and may imply a longer stay in hospitalizations[11].

Table 4- Hospitalizations due to DM according to age group from January 2020 to May 2023.

Age group	Region North	Region Northeast	Southeast Region	Region On	Region Midwest	Total	%
< 1 year	96	266	283	75	69	789	0,17
1 to 4 years	162	1.064	1.561	608	389	3.784	0,84
5 to 9 years	286	1.794	2.797	1.127	653	6.657	1,49
10 to 14 years	541	3.103	5.427	1.786	1.307	12.164	2,73
15 to 19 years old	460	2.422	4.621	1.936	851	10.290	2,30
20 to 29 years old	1.275	4.796	8.769	3.863	1.741	20.444	4,58
30 to 39 years old	2.531	7.657	10.238	4.147	2.102	26.675	5,98
40 to 49 years old	6.168	14.953	17.894	5.645	3.886	48.546	10,89
50 to 59 years old	10.553	26.984	32.558	10.583	6.210	86.888	19,50
60 to 69 years old	12.955	34.260	40.071	14.658	6.832	108.776	24,42
70 to 79 years old	8.691	28.432	26.696	11.465	4.509	79.793	17,91
≥ 80 years old	3.882	16.609	12.576	5.542	2.001	40.610	9,11
Total	47.600	14.2340	16.3491	61.435	30.550	445.416	100

Source: Ministry of Health - SUS Hospital Information System (SIH/SUS)

Table 5 shows that the male group had the highest prevalence of hospitalization in all the years studied, corresponding to a total of 52% (n=231,958). The female group also showed an increase in the number of hospitalizations, with approximately 3,158 new cases per year.

Historically, women have greater concern and care for their health, they more frequently seek primary health care services, in addition to presenting greater fidelity to drug treatment, improving care with prevention and health promotion[11]. For men, there was an increase in the number of hospitalizations, especially between 2021 and 2022. This increase is justified by the low demand for health care, mainly in a preventive manner through Primary Care (PHC). However, when they are affected by serious changes in their health status, they seek hospital services of medium and high complexity, with many cases in advanced stages of the disease[15].

In view of this, it is necessary to develop and strengthen actions for men's health in the primary health care network, in addition to stimulating the various factors that stimulate the presence of the male public in health services, such as social, cultural, individual and collective factors[14].

Table 5- Hospitalizations due to DM in relation to sex in the period from January 2020 to May 2023.

Processing Year	Mask	Five	Total	%
2020	64.923	59.723	124.646	27,98
2021	66.833	61.255	128.088	28,75
2022	71.202	66.040	137.242	30,81
2023	29.000	26.440	55.440	12,44
Total	231.958	213.458	445.416	100

Source: Ministry of Health - SUS Hospital Information System (SIH/SUS)

Regarding the amounts directed to hospital services directed to hospitalizations, there was a high financial impact, exceeding 351 million reais in the interval from January 2020 to May 2023, as shown in table 6. Among the regions analyzed, the Southeast is the one that used the most financial resources in the last three years, reaching 42.7% (n= 150,315,305.40).

In a study, Júnior et al[14] found similar data, considering the burden caused by the disease to be significant, which is a significant portion of the amounts invested in health. The increase in the number of hospitalizations causes direct costs to the health system, as a result of the use of clinical resources, expenses with patients and their families, as well as travel for care[16].

Table 6- Value of hospital services with DM by region from January 2020 to May 2023.

Region	2020	2021	2022	2023	Total	%
North Region	7.304.392,24	8.446.323,74	10.208.529,23	4.442.116,9	30.401.362,11	8,6
Northeast Region	24.998.966,1	27.326.252,96	31.428.777,51	13.545.863,09	97.299.859,66	27,6
Southeast Region	40.266.067,69	40.376.023,91	48.798.730,17	20.874.483,6	150.315.305,4	42,7
South Region	13.033.975,77	13.606.504,33	16.304.611,96	7.100.179,98	50.045.272,04	14,2
Midwest Region	5.928.493,21	6.137.666,29	7.812.874,25	3.549.894,35	23.428.928,1	6,6
Total	91.531.895,01	95.892.771,23	114.553.523,1	49.512.537,92	351.490.727,3	100

Source: Ministry of Health - SUS Hospital Information System (SIH/SUS)

The costs of NCDs have a negative impact on the economy, consumption and productivity, making it necessary to develop effective interventions for the prevention and control of the disease[17].

It is necessary to pay more attention to people with diabetes, because in his study, Muzy[18] reports that the difficulty in accessing health services and the lack of tests generate a higher prevalence of complications and a greater agglomeration of hospitalizations, in addition to emergency room visits.

4 CONCLUSION

It was found that the information on the number of hospitalizations, hospital costs and deaths are suffering a significant increase every year as a result of complications due to DM, causing significant impacts to the public coffers. The results found here were similar to those of other Brazilian studies, corroborating the need to use information systems as a source for planning health-related actions, enabling the control of the disease in primary care and consequent improvement of hospital care. It is of paramount importance to carry out more studies that add more variables, in order to intensely identify the magnitude of the disease in Brazil.

The data presented here show that prevention, in addition to the follow-up and monitoring of NCDs, especially diabetes, by health services, are of fundamental importance.

In addition, it is worth emphasizing the importance of monitoring individuals with DM by a multidisciplinary team. The multidisciplinary approach is ideal for the effectiveness of the monitoring and treatment of the disease, as it involves actions related to drug treatment, diet therapy, as well as education in the care and prevention of complications.

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