

# Hospital admissions for diabetes mellitus among children and adolescents in Mato Grosso, 2010-2020

Internação hospitalar por diabetes mellitus entre crianças e adolescentes de Mato Grosso, 2010-2020

Admisiones hospitalarias para diabetes mellitus de niños y adolescentes en Mato Grosso, 2010-2020

## RESUMO

Objetivo: Analisar a distribuição temporal das internações hospitalares por diabetes mellitus entre crianças e adolescentes residentes no estado de Mato Grosso, 2010-2020. Método: Estudo epidemiológico descritivo, quantitativo, com delineamento transversal, pautado em dados secundários dos censos demográficos de 2010, e do Sistema de Informações Hospitalares Resultados: observou-se maior prevalência de internações do sexo feminino (65,12%), parda (56,17%), faixa etária de 15-19 anos (38,46%), regime de urgência (98,30%). A taxa de internação registrada na faixa etária de 5-9 anos 9,45/100.000 habitantes em 2020, 19,53/100.000 hab. entre indivíduos de 10-14 anos e 14,42 /100.000 hab. nos adolescentes de 15-19 anos. Conclusões: As hospitalizações por diabetes mellitus é um grave problema de saúde pública entre crianças e adolescentes de Mato Grosso. Os dados reforçam a importância das políticas de saúde direcionadas ao diagnóstico, tratamento, acompanhamento/seguimento dos pacientes e prevenção das complicações clínicas decorrentes do diabetes mellitus.

**DESCRIÇÕES:** Criança; Adolescente; Internações; Diabete Mellitus.

## ABSTRACT

Objective: To analyze the temporal distribution of hospital admissions for diabetes mellitus among children and adolescents living in the state of Mato Grosso, 2010-2020. Method: Descriptive, quantitative, cross-sectional epidemiological study, based on secondary data from the 2010 demographic censuses and the Hospital Information System Results: there was a higher prevalence hospitalizations of females (65.12%), mixed race (56.17%), aged between 15-19 years (38.46%), and emergency room (98.30%). The hospitalization rate registered in the age group from 5-9 years old was 9.45/100,000 habitants in 2020, 19.53/100,000 habitants, among individuals aged 10-14 years and 14.42 /100,000 hab. in adolescents aged 15-19 years. Conclusions: Hospitalizations for diabetes mellitus are a serious public health problem among children and adolescents in Mato Grosso. The data reinforce the importance of health policies aimed at the diagnosis, treatment, follow-up/follow-up of patients and prevention of clinical complications resulting from diabetes mellitus.

**DESCRIPTORS:** Child; Adolescent; Admissions; Diabetes Mellitus.

## RESUMEN

Objetivo: Analizar la distribución temporal de los ingresos hospitalarios por diabetes mellitus entre niños y adolescentes residentes el Mato Grosso, 2010-2020. Método: Estudio epidemiológico descriptivo, cuantitativo, transversal, con base en datos secundarios de los censos demográficos de 2010 del Sistema de Información Hospitalaria Resultados: Mayor prevalencia de hospitalizaciones de mujeres (65,12%), mestizos (56,17%), de 15-19 años (38,46%) y urgencias (98,30%). La tasa de hospitalización el edad de 5 a 9 años fue de 9,45/100.000 habitantes en 2020, 19,53/100.000 habitantes entre individuos de 10-14 años y 14,42/100.000 hab. adolescentes de 15-19 años. Conclusiones: Las hospitalizaciones por diabetes mellitus, son un grave problema de salud pública entre los niños y adolescentes de Mato Grosso. Los datos refuerzan la importancia de las políticas sanitarias dirigidas al diagnóstico, tratamiento, seguimiento de los pacientes y prevención de las complicaciones clínicas derivadas de la diabetes mellitus.

**DESCRIPTORES:** Niño; Adolescente; Admisiones; Diabetes Mellitus.

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## INTRODUCTION

**O** diabetes mellitus (DM) is a chronic metabolic syndrome characterized by persistent hyperglycemia, resulting from a deficiency in insulin production or action, or in both mechanisms.<sup>1</sup> Insulin is a hormone produced by the pancreas, responsible for maintaining glucose metabolism, and the absence of this hormone causes deficiency in glucose metabolism, causing permanent accumulation of glucose in the bloodstream. DM is an important global public health problem that has reached epidemic proportions, with an estimated 425 million people with DM worldwide.<sup>1</sup>

Diabetes mellitus is classified as type 1 diabetes mellitus (DM1) caused by the destruction of insulin-producing cells, due to a defect in the immune system in which antibodies attack the cells that produce insulin. Type 1 diabetes mellitus (dm1) is a chronic autoimmune disease, being in most cases diagnosed in children and adolescents. It is a disease caused by insufficient production or poor absorption of insulin, a hormone

that regulates blood glucose and provides energy for the body. Type 2 diabetes mellitus (DM2) results from insulin resistance and insulin secretion deficiency. DM2 mainly affects individuals from the fourth decade of life and corresponds to 90 to 95% of all DM cases in the world.<sup>1</sup>

It is estimated that 98,200 children and adolescents under the age of 15 are diagnosed with DM1 each year, and that Brazil ranks third in the prevalence of DM1 in the world, according to the International Diabetes Federation.<sup>1</sup> Several studies point to an increase in the prevalence of DM2 in children and adolescents.<sup>2,3,4</sup> DM in children and adolescents is directly related to longer hospital stays and contributes to other health problems, such as cardiovascular disease, metabolic syndrome, blindness and kidney failure.<sup>5</sup> In parallel with the increase in the prevalence of DM2, there is also an association between this pathology and obesity, which is directly associated with insulin resistance.<sup>6</sup>

Hospitalizations of children and adolescents result from the lack of control of glycemic levels, associated with poor metabo-

lic control and represent a risk to the lives of these individuals.<sup>6</sup> Given the above, the present study aims to analyze the temporal distribution of hospital admissions for diabetes mellitus among children and adolescents residing in the state of Mato Grosso, 2010-2020.

## METHOD

This is a descriptive, quantitative, epidemiological study with a cross-sectional design, based on secondary data from the 2010 demographic censuses and the Hospital Information System (SIH/SUS). The scenario of this study is the state of Mato Grosso, located in the Midwest region of the country, bordering the states of Rondônia, Amazonas, Pará, Tocantins, Goiás, Mato Grosso do Sul and bordering Bolivia. It has 141 municipalities, with a territorial extension of 903,357,908 km<sup>2</sup> and a total population of 3,035,122 inhabitants, among which 43,226 are indigenous.<sup>7</sup>

The study population consisted of hospital admissions of children and adolescents for diabetes mellitus in Mato Grosso

from 2010 to 2020. Hospital admissions of children and adolescents residing in Mato Grosso and recorded from January 1, 2010 to December 31, 2020 will be included. Hospital admissions of children and adolescents due to diabetes mellitus who presented incomplete data, erroneous or duplicates. Population data were obtained from the 2010 demographic census of the Institute of Geography and Statistics (IBGE). Data on hospital admissions will be extracted from the SUS Hospital Information System (SIH/SUS).

The choice was made for the variables by Race/color: (white, black, brown, yellow, indigenous); Gender: male and female; Age range: 5 to 9 years old, 10 to 14 years old, 14 to 18 years old; Character of care: elective or urgent; Regime of the hospital unit: public, private.

Data collection was carried out in a single step in the period between May 5 and 10, 2021 through access to the DATASUS website. The collected data were properly organized in a database spreadsheet using Microsoft Excel Windows 2016. Data analysis was performed in two stages: 1) characterization of the sociodemographic profile and care of adolescents hospitalized for diabetes mellitus; 2) estimation of hospital admission rates for children and adolescents due to diabetes mellitus.

The estimation of the hospital admission rate of children and adolescents for DM was performed using descriptive statistics, according to formula 1.

$$THDM = \frac{(\text{NÚMERO DE HOSPITALIZAÇÕES})}{(\text{POPULAÇÃO RESIDENTE})} \times 100.000$$

where: Number of hospitalizations: total hospital admissions recorded in the period; Resident population: population residing in Mato Grosso during the study period.

In order to carry out the study, information extracted from SINAN available for public consultation was used, not being necessary to submit it to the Research Ethics Committee (CEP), however, for the development of the research, the provisions contained in Resolution No. 466/2012 of

the National Health Council (CNS) were followed.

## RESULTS

During the study period, 1,118 hospital admissions for diabetes mellitus were recorded among children and adolescents. In 2018, there was the lowest prevalence of hospitalizations for DM (7.07%), and in the year 2019 a total of 129 hospitalizations, representing a percentage (11.54%) and a rate of 23.10/100,000 inhabitants, Table 1.

The sociodemographic and care profile of children and adolescents hospitalized for diabetes mellitus in Mato Grosso, 2010-2020, points to a higher prevalence of hospitalizations in females (65.12%), mixed race/color (56.17%), and aged between 15 and 19 years (38.46%). Regarding the nature of the service, it was noted that 98.30% of the consultations were performed on an emergency basis, in units of the unified health system (28.00%) and 25.31% in the private network, Table 2.

When proceeding with the temporal distribution of the hospital admission rate for diabetes mellitus in children and adolescents residing in Mato Grosso, 2010-

2020, it was found that the rate recorded in the age group of 5 to 9 years in 2010 was 6.7 hospitalizations per 100,000 inhabitants, 7.87/100,000 inhab. in 2015 and 9.45/100,000 inhab. in 2020. In the age group from 10 to 14 years old, the rate in 2010 was 13.5 hospitalizations per 100,000 inhabitants, 10.65/100,000 inhab. in 2015 and 19.53/100,000 inhab. in the year 2020. Among adolescents aged 15 to 19, in 2010 there was a rate of 20.75/100,000 inhabitants, 11.96/100,000 inhab. in 2015 and 14.42/100,000 inhab. in 2020, Figure 1.

## DISCUSSIONS

The highest percentage of female hospitalizations (65.12%) evidenced in this study corroborates the data from the research carried out in Fortaleza-CE, which found a higher prevalence of visits to female individuals. 8 Research on hospitalizations of children for DM in Mato Grosso showed a higher percentage of hospital admissions among females (61.43%).<sup>9</sup> A study carried out in Blumenau-SC identified a higher percentage of hospitalizations among females (55.60%).<sup>10</sup>

DM is a chronic disease that affects individuals of both sexes, and the higher oc-

Table 1. Distribution of hospital admissions for diabetes mellitus among children and adolescents in Mato Grosso, 2010 -2020.

Year	N	%	Rate*
2010	114	10,20	20,41
2011	109	9,75	19,52
2012	93	8,32	16,65
2013	98	8,77	17,55
2014	100	8,94	17,90
2015	84	7,51	15,04
2016	98	8,77	17,55
2017	82	7,33	14,68
2018	79	7,07	14,14
2019	129	11,54	23,10
2020	120	10,73	21,48
-----	1118	100,00	-----

N: frequência absoluta; %: porcentagem; \* taxa de internação: 100.000 hab. IC95%: intervalo de confiança de 95%. Fonte: SIH SUS, 2021.

currence of hospitalizations in this study can be explained by the greater attention given to health by girls. Female adolescents are more attentive and sensitive to changes in their health, in addition to the fact that attendance at periodic consultations can directly influence the treatment of complications earlier than in boys.<sup>11</sup>

Regarding race/color, there was a predominance of hospitalizations in brown individuals (56.16%). Research with patients from a reference center in Fortaleza-CE, observed a higher percentage of hospitalizations among pardos (56.25%)<sup>8</sup>, corroborating the data indicated in this study. However, the scientific literature consulted does not present evidence of the relationship between DM and the race/color variable.<sup>8</sup> The higher prevalence of DM in children and adolescents in Mato Grosso can be explained by the demographic issue of this population segment. In the 2010 Demographic Census, 820,053 children and adolescents between 5 and 19 years old were registered, of these, 461,324 declared they belonged to the brown race/color.<sup>7</sup>

Regarding the age group, there was a higher percentage of hospitalizations between 15 to 19 years old (38.46%) and 10 to 14 years old (38.10%), however, there was no significant difference between the mentioned age groups. In the study in Fortaleza, there was a greater predominance of care among children aged between 10 and 14 years (63.12%).<sup>8</sup> A study identified a mean age of 11 years among children and adolescents treated in secondary care in Blumenau-SC. 10 DM1 is increasingly being diagnosed early, and the higher percentage of hospitalizations in adolescents can be explained by their autonomy and knowledge regarding their disease and treatment.<sup>8</sup>

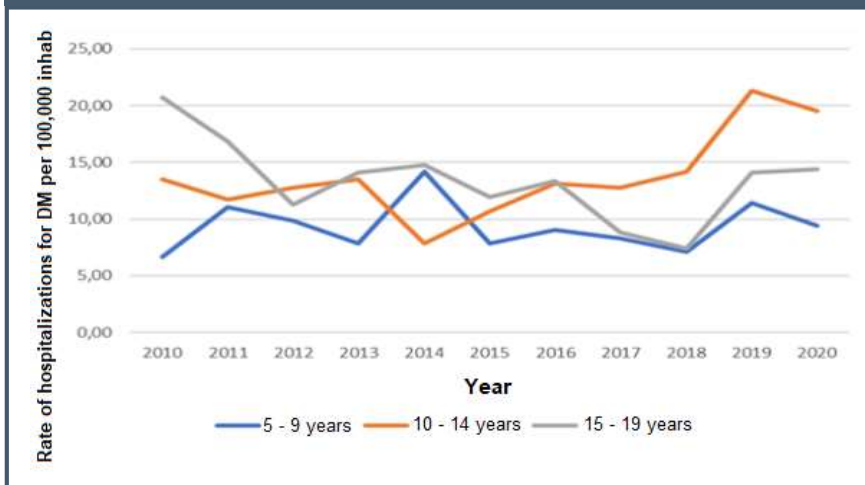
Urgency was the type of service reported in 98.30% of the cases. The literature consulted did not present discussions about this variable, however, it is worth noting that hospitalizations for DM represent a potential risk to the lives of children and adolescents, in addition to representing high costs for public or private health services. Among the complications of DM, diabetic ketoacidosis is the main complication

Table 2. Sociodemographic and care profile of children and adolescents hospitalized for diabetes mellitus in Mato Grosso, 2010-2020.

Variables	N	%
Sex		
Male	390	34,88
Female	728	65,12
Race/color		
White	185	16,55
Yellow	23	2,06
Brown	628	56,17
Black	25	2,24
Indigenous	6	0,54
Ignored	251	22,45
Age group		
5 to 9 years	262	23,43
10 to 14 years	426	38,10
15 to 19 years	430	38,46
Service Character		
Elective	19	1,70
Urgency	1099	98,30
Hospital Unit Regime		
Public	313	28,00
Private	283	25,31
Ignored	522	46,69

N: absolute frequency, %: percentage. Source: SIH SUS, 2021

Figure 1. Temporal distribution of hospital admission rate for diabetes mellitus in children and adolescents residing in Mato Grosso, 2010-2020.



Source: SIH SUS, 2021

of diabetes mellitus in the pediatric range, affecting mainly females and children, and represents a complication that requires a long hospital stay.<sup>9</sup> Being the main reason for hospitalizations of patients with DM1 due to lack of control of the disease.<sup>11</sup>

The temporal distribution of hospitalization rates for DM according to age group showed an increase in hospitalization rates among individuals aged 10 to 14 years and 15 to 19 years, in agreement with the data observed in the time series study of DM mortality.<sup>13</sup> The greater occurrence of hospitalizations at this stage of life may be related to complications that occur in this age group due to carelessness with the disease, due to particular issues of age, which results

in lack of control of glycemic levels and the consequent worsening of health status.<sup>14,15</sup> The higher hospitalization rate observed in this study may also be related to the higher incidence of diagnoses in this age group.<sup>16</sup>

## CONCLUSIONS

The high hospitalization rates represent high economic and social costs to the public coffers, and represent a serious public health problem in the context of the state of Mato Grosso, above all because of the seriousness that such hospitalizations represent for the health and quality of life of children, adolescents and their families.

The highest percentage of hospitaliza-

tions in emergency care show the failures of primary care services and evoke the need to face this health problem by the government, health professionals, family members and society in general.

The data reinforce the importance of implementing and implementing health policies aimed at early diagnosis, timely and effective treatment, monitoring/follow-up of patients, prevention of clinical complications resulting from DM and consequently hospitalizations or deaths.

It is recommended that health education measures be directed to this population segment and their respective caregivers, aiming to prevent clinical complications such as diabetic ketoacidosis.

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