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RESEARCH

DESCRIPTIVE STUDY ON HOSPITALIZATION EPISODES DUE TO DIABETES MELLITUS, SITUATION IN ROMANIA IN THE LAST DECADE

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Diabetes mellitus, one of the challenges in terms of public health at a global level, with a constant upward evolution in terms of morbidity and mortality indicators, registers a similar trend in Romania. Although in our country the values of prevalence, incidence, but also the mortality rate due to diabetes mellitus are still at a lower level than the values of the European region and those of the European Union, the constant upward trend indicates that more effective measures are needed to reduce the negative impact of the disease through better monitoring of the health status of the population, diagnosing patients with prediabetes, establishing antidiabetic treatment early, in order to avoid increased costs related to complications and premature deaths.

Keywords: diabetes mellitus, hospitalization, Romania

INTRODUCTION

Diabetes mellitus, one of the chronic diseases that is recording an upward trend in terms of both morbidity and mortality indicators, represents one of the challenges in terms of public health at a global level [1]. Thus, the average trend in the incidence of diabetes mellitus increased annually worldwide from 1990 to 2019 by 3.73 cases/100,000 inhabitants, and the average trend in mortality due to the disease increased annually until 2005 by 0.43 cases, after which an annual decrease of 0.001 per 100,000 inhabitants was recorded until 2019. The upward trend concerns both developed and low- and middle-income countries, and the upward trend in incidence is expected to continue, with the number of cases estimated to reach 366 million globally by 2030, more than double the number in 2000, when there were 171 million cases worldwide. The WHO report on diabetes mortality indicates a 3% increase from 2000 to 2019, when the disease caused the death of 1.5 million, with the figure increasing to 3.4 million in 2024, with 1 person with diabetes dying every 6 seconds [1], [2]. In terms of disease prevalence, an estimated 589 million adults (20-79 years) with DM are estimated to have DM globally, representing 1 in 9 people, and by 2050, 1 in 8 people, 853 million, an increase of 45%. The largest increases are estimated in Africa (142%), the Middle East and North Africa (92%) and South East Asia (73%). The highest prevalence is found in low- and middle-income countries/capita, 4 in 5 adults with DM live in such countries. In addition to diagnosed DM, many people with undiagnosed disease are estimated, about 252 million people in 2024, 90% of whom live in economically less developed countries [2].

In Europe, the prevalence of DM was 9.2% in 2021 and is estimated to reach 9.8% in 2030, an increase from 61 million patients in 2021 to 67 million in 2030. Practically, 1 in 11 adults has DM, while 1 in 3 Europeans has undiagnosed DM, its prevalence being 35.7% (21.9 million) [3]. Mortality due to DM recorded a value of 1.1 million in 2021 [3]. 294,900 children had type 1 DM in 2021, and each year another 31,000 children are diagnosed with type 1 DM, the European region having the highest value globally [3]. In Romania, in 2021, the prevalence of the disease among adults was 8.4% [3]. According to the Public Health National Institute, there has been a constant increase in the prevalence of the disease in the last decade, from 832545 patients registered in 2012 to 1254870 in 2021, with 18 counties having values above the national average of 6561.7/100000 inhabitants, the highest values being recorded in Hunedoara (9316.6‰ inhabitants), Olt, Bucharest, Brașov, and as regions Bucharest Ilfov and North East. According to official data from WHO / EUROPA, HFA DATABASE, 2022, Romania is among the countries below the EU average with a prevalence value of 3.9% below the 5.5% EU average and 4.4% average for the European region [4]. The incidence of the disease is also increasing from 63,739 new cases in 2012 to 82,552 in 2021, of which 80.5% are patients with type 2 diabetes. This year, the average incidence value in Romania was 431.7‰ people, with 21 counties exceeding this value. The highest values are observed in the counties of Caraș Severin (1,648.4‰ people) and Călărași, almost 4 times the national average, and the regions with the highest values are South Muntenia and the West region [4].

And DM mortality is on an upward trend, from a DM mortality rate of 10.2%000 in 2012 to 19.7%000 in 2021, with the counties with the highest values being Dâmbovița, Călărași, Argeș and Botoșani. While the DM type 1 mortality rate is decreasing (from 578 deaths in 2012 to 530 deaths in 2021), the DM type 2 mortality rate is increasing (from 1276 deaths in 2012 to 2230 in 2021). [4]. Compared to European values, the mortality rate in Romania was 8.8% in 2022 compared to the EU average of 11.3% and the European region of 15%.

Although efforts are being made to reduce the negative consequences and impact of the disease on the population and society, according to expert estimates, the trend in terms of morbidity due to DM is an upward one, and the mortality and disability associated with this condition will not experience a very favorable evolution in the future either. Therefore, knowledge of the dynamics of the degree of population impairment, permanent monitoring of the evolution of the casuistry and the determining risk factors of the disease is a necessity, and the study/analysis of the frequency of hospitalization episodes, therefore of serious casuistry, which requires hospital medical care, best reflects the extent of the phenomenon. National Institute of Health Services Management (NIHSM) periodically carries out analyses of hospital morbidity and mortality, trying to outline the picture of the phenomenon at different points in time to be able to conclude regarding the evolutionary trend of various chronic conditions, with a significant impact on the health status of the →

population. The present study analyzes the evolution of DM episodes requiring hospitalization over the last ten years, the results of which are presented below.

OBJECTIV

Identification at national, regional, and local level of the geographical distribution of hospitalization episodes in patients diagnosed with diabetes mellitus (DM), as well as the temporal evolution of their number, during the period 2014-2024.

METHODOLOGY

A descriptive, retrospective study was conducted using data from the National DRG Database, the data being reported in continuous hospitalization by hospitals in Romania in contractual relationship with the National Health Insurance House. In accordance with the provisions of Order no. 1782/576/2006 on the registration and statistical reporting of patients receiving medical services in continuous hospitalization and day hospitalization, with subsequent additions and amendments, NIHSM collects and processes the minimum set of patient-level data for cases treated in continuous and day hospitalization. The study used data that were reported during the period 2014-2024, aiming to analyze data on hospitalization episodes in the case of patients with DM in Romania, in the aforementioned (continuous hospitalizations). The data were selected using the ICD-10-AM classification, records from the observation sheets were extracted and analyzed, which most frequently had as the main diagnosis one of the codes: E10 Diabetes mellitus type 1, includes: diabetes (mellitus): autoimmune, frail, idiopathic, insulin-dependent [IDDM], with onset in young people, prone to ketosis - E10.1 Diabetes mellitus type 1 with acidosis (E10.11, E10.12, E10.13, E10.14, E10.15, E10.16), E10.2 Diabetes mellitus type 1 with renal complications (E10.21, E10.22, E10.23, E10.29), E10.3 Diabetes mellitus type 1 with ocular complications (E10.31, E10.32, E10.33, E10.34, E10.35, E10.36, E10.39), E10.4 Type 1 diabetes mellitus with cataract with neurological complications (E10.41, E10.42, E10.43, E10.49), E10.5 Type 1 diabetes mellitus with circulatory complications (E10.51, E10.52, E10.53), E10.6 Type 1 diabetes mellitus with other specified complications (E10.61, E10.62, E10.63, E10.64, E10.65, E10.69), E10.7 Type 1 diabetes mellitus with multiple complications (E10.71, E10.73), E10.8 Type 1 diabetes mellitus with unspecified complications, E10.9 Type 1 diabetes mellitus without complications, E11 Diabetes mellitus type 2 Includes: diabetes (mellitus) (without obesity) (obesity) - adult-onset, - due to a defect in insulin secretion - insulin-resistant - mature-onset - nonketonic - E11.0 Diabetes mellitus type 2 with hyperosmolarity (E11.01, E11.02), E11.1 Diabetes mellitus type 2 with acidosis (E11.11, E11.12, E11.13, E11.14, E11.15, E11.16), E11.2 Diabetes mellitus type 2 with renal complications (E11.21, E11.22, E11.23, E11.29), E11.3 Diabetes mellitus type 2 with ocular complications (E11.31, E11.32, E11.33, E11.34. E11.35, E11.36, E11.39), E11.4 Type 2 diabetes mellitus with neurological complications (E11.40, E11.41, E11.42, E11.43, E11.49), E11.5 Type 2 diabetes mellitus with circulatory complications (E11.51, E11.52, E11.53), E11.6 Type 2 diabetes mellitus with other specified complications (E11.61, E11.62, E11.63. E11.64, E11.65, E11.69), E11.71 Type 2 diabetes mellitus with multiple microvascular complications, E11.72 Type 2 diabetes mellitus with features of insulin resistance, E11.73 Type 2 diabetes mellitus with foot ulceration due to multiple causes, E11.8 Type 2 diabetes mellitus with unspecified complications, E11.9 Type 2 diabetes mellitus without complications, E13 Other specified forms of diabetes mellitus Includes: diabetes mellitus (due to) (in) (secondary) (with): - drug-induced or chemically induced, endocrinopathy, genetic defect of: beta-cell function, insulin action, genetic syndrome, immune-mediated disease, infection, mature onset of the young (MODY), exocrine pancreatic disease - E13.0 Other specified forms of diabetes mellitus with hyperosmolarity (E13.01, E13.02), E13.1), Other specified forms of diabetes mellitus with acidosis (E13.11, E13.12, E13.13, E13.14, E13.15, E13.16), E13.2 Other specified forms of diabetes mellitus with renal complications (E13.21, E13.22, E13.23, E13.29), E13.3 Other specified forms of diabetes mellitus with ocular complications (E13.31, E13.32, E13.33, E13.34, E13.35, E13.36, E13.39), E13.4 Other specified forms of diabetes mellitus with neurological complications (E13.40, E13.41, E13.42, E13.43, E13.49), E13.5 Other specified forms of diabetes mellitus with circulatory complications (E13.51, E13.52, E13.53), E13.6 Other specified forms of diabetes mellitus with other specified complications (E13.61, E13.62, E13.63, E13.64, E13.65, E13.69), E13.7 Other specified forms of diabetes mellitus with multiple complications (E13.71, E13.72, E13.73), E13.8 Other specified forms of diabetes mellitus with unspecified complications, E13.9Other specified forms of diabetes mellitus without complications, E14 Diabetes mellitus, unspecified - E14.0 Diabetes mellitus, unspecified with hyperosmolarity (E14.01, E14.02), E14.1 Diabetes mellitus, unspecified with acidosis (E14.11, E14.12, E14.13, E14.14, E14.15, E14.16), E14.2 Diabetes mellitus, unspecified with renal complications (E14.21, E14.22, E14.23, E14.29), E14.3 Diabetes mellitus, unspecified with ocular complications (E14.31, E14.32, E14.33, E14.34, E14.35, E14.36, E14.39), E14.4 Diabetes mellitus, unspecified with neurological complications (E14.40, E14.41, E14.42, E14.43, E14.49), E14.5 Unspecified diabetes mellitus with circulatory complications (E14.51, E14.52, E14.53), E14.6 Unspecified diabetes mellitus with other specified complications (E14.61, E14.62, E14.63, E14.64, E14.65, E14.69), E14.7 Unspecified diabetes mellitus with multiple complications (E14.71, E14.72, E14.73), E14.8 Unspecified diabetes mellitus with unspecified complications, E14.9 Unspecified diabetes mellitus without complications.

In accordance with the provisions of Law 190/2018 and Art. 13 of EU Regulation no. 679/2016, personal data are deleted upon transmission to NIHSM, and the identification of persons for the purpose of analysis is based on encrypted personal identification code. The age of the patients was calculated in years, as the difference between the date of admission and the date of birth. The data were processed using the SQL Server Management Studio Express 2005 software program, the subsequent processing and analysis was performed using SPSS and Excel programs. The analysis was performed according to a series of demographic and socioeconomic

variables, such as age, length of hospitalization, discharge status, etc., information included in the minimum data set reported in the DRG system by hospitals. The interpretation and presentation performed in the form of tables and graphs.

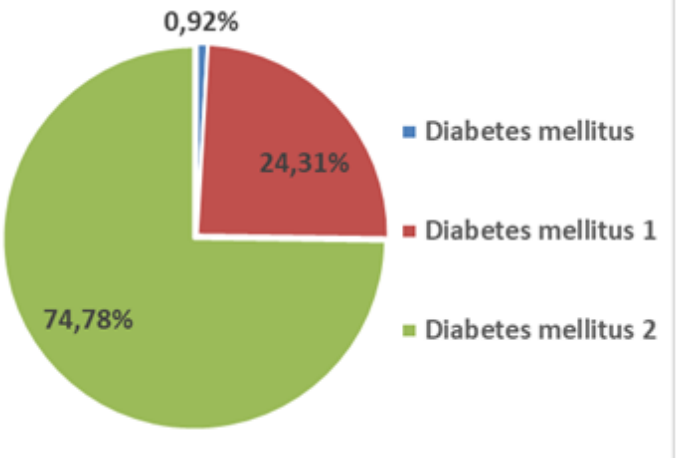
RESULTS

The data extracted from the national DRG database were processed, analyzed, and interpreted in relation to a series of demographic variables and socioeconomic characteristics (sex, age, area of residence, length of hospitalization, in-hospital mortality rate, discharge status) tracking the geographical distribution and temporal evolution of hospitalization episodes in patients with diabetes mellitus, in hospitals in our country, during the period 2014-2024.

1. Total number of hospitalization episodes in patients with DM, registered in Romania, during 2014 -2024

The total number of continuous hospitalization episodes for patients with DM registered in Romania, during the period 2014-2024, was 553,400 episodes, of which most were coded as type 2 diabetes mellitus (75%), and 24% were hospitalization episodes due to type 1 diabetes mellitus – graph no. 1

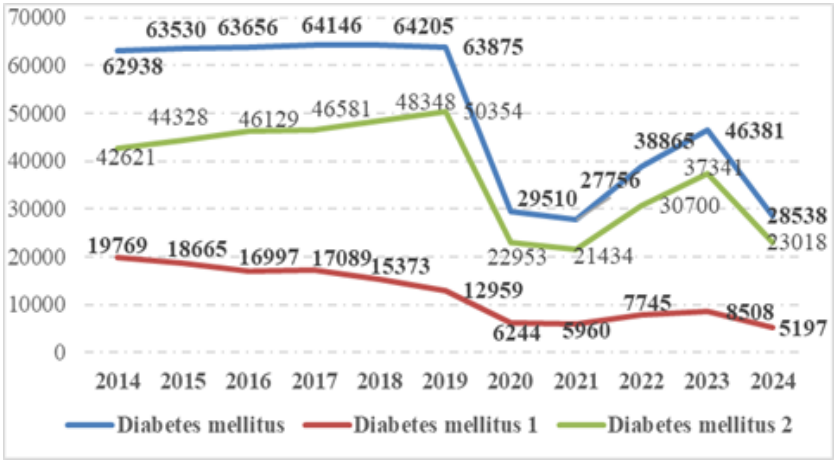
Graph no. 1. Hospitalization episodes by type of main diagnosis at discharge, in patients with DM, 2014-2024 at national level



The most common coding for type 2 diabetes mellitus were: Type 2 diabetes mellitus with diabetic polyneuropathy (19%), Type 2 diabetes mellitus with poor control (18%), Type 2 diabetes mellitus with multiple microvascular complications or Type 2 diabetes mellitus with other specified complications (approx. 16%). In the case of type 1 diabetes, the most common coding were Type 1 diabetes mellitus with multiple microvascular complications (21%) or Type 1 diabetes mellitus with poor control (20.6%).

2. Temporal evolution in terms of hospitalization episodes of patients with DM, in Romania, 2014-2024

Graph no. 2. Evolution hospitalization episodes in patients with DM, 2014-2024 at national level



The temporal evolution of hospitalization episodes in patients with DM during this period can be seen in graph no. 2. It is noted that the hospitalization situation was approximately constant until 2020, with the onset of the coronavirus pandemic, hospitalizations being reduced by approximately 2 times. From 2022, the upward slope of hospitalizations resumes, with 2023 representing the year with the most episodes, however in a much smaller number compared to the period before 2020. Type 2 diabetes recorded an upward trend in hospitalizations before the pandemic, so that during the pandemic the same reduction of approximately 2 times in the number of hospitalization episodes was observed, which began to increase starting in 2022. The halving of hospitalizations during the pandemic is also observed for cases of type 1 diabetes, with the mention that before the coronavirus pandemic the number of hospitalizations was in a marked decrease, with approximately 1.5 times fewer cases in 2019 compared to 2014.

3. Distribution of hospitalization episodes of patients with DM, by discharge department

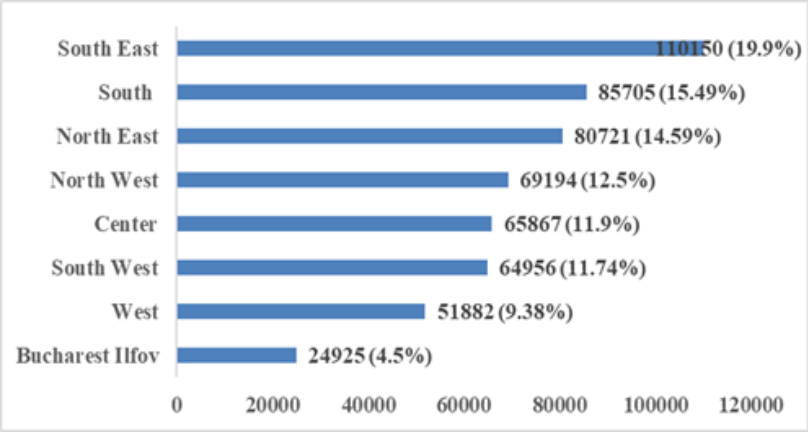
The most hospitalization episodes for patients with DM were recorded in the Diabetes, Nutrition and Metabolic Diseases departments (60% of the total) and Internal Medicine (20%).

4. Distribution of hospitalization episodes in patients with DM, at regional and local level, 2014-2024

In terms of the residential environment where patients with this diagnosis come from, it is found that most hospitalization episodes were recorded in patients from urban areas (55%). At regional level, most hospitalization episodes for patients with DM were recorded during the study period in the South East regions (20% of the national total), South and North East approximately 15%. The Bucharest Ilfov regions, with approximately 4.5% and West 9%, had the fewest hospitalizations - graph no.3.

Compared to the number of inhabitants (average population in the last 10 years in each region), the descending order of regions that recorded hospitalization episodes of patients with DM was: South East region →

Graph no. 3. Distribution of hospitalization episodes in patients with DM, at regional level in Romania, 2014-2024



Graph no. 4. Distribution of hospitalization episodes in patients with DM, by population (10-year average) at regional level, in Romania, 2014-2024

(457.80 episodes/10,000 people), South West region (336.97 episodes/10,000 people), West (296.22 episodes/10,000 people), South (292.18 episodes/10,000 people), Center region (284.61 episodes/10,000 people), North West region (270.91 episodes/10,000 people), North East (250.21 episodes/10,000 people) and Bucharest Ilfov region (108.41 episodes/10,000 people) - graph no. 4.

At the local level, the most hospitalization episodes were recorded between 2014-2024 in Buzău, Suceava, Timiș counties. The last places are occupied by Sălaj, Vaslui and Dâmbovița counties – graph no. 5.

Compared to the population of each county (calculated as the average of the 10 years), a change in the ranking is observed in graph no. 6, with the counties of Buzău (1172.03 episodes/10,000 people), Mehedinți (803.78 episodes/10,000 people) and Covasna (694.27 episodes/10,000 people) in the first places, and the municipality of Bucharest and the counties of Iași and Dâmbovița in the last places.

5. Distribution of hospitalization episodes in patients with DM, by patient's gender

Of the total number of hospitalization episodes with this type of main diagnosis at discharge, recorded during the study period, most belonged to women, approximately 51%, and the distribution of cases according to the type of diagnosis at discharge and gender can be seen in graph no. 7. If in the case of type 2 diabetes most hospitalization episodes were recorded among women, in the case of type 1 diabetes, the male gender predominates.

6. Distribution of hospitalization episodes in patients with DM, by patient's age

Data analysis by age group shows that for the entire study period, most hospitalization episodes were recorded in people over 70 years of age (68% of the total), but a significant percentage is also observed in adults over 50 years of age (32%). The average age of those hospitalized during this period was 60.24 years, by area of residence the ages have similar averages (60.16 years in rural areas and 60.315 in urban areas), and by gender the average age was 58.41 years in men and 62 years in women. By diagnosis type, the average age values were the lowest in patients diagnosed with type 1 diabetes (49.77 years), and the highest in patients with type 2 diabetes (65.23 years).

7. Distribution of hospitalization episodes in patients with DM, by the average duration of hospitalization

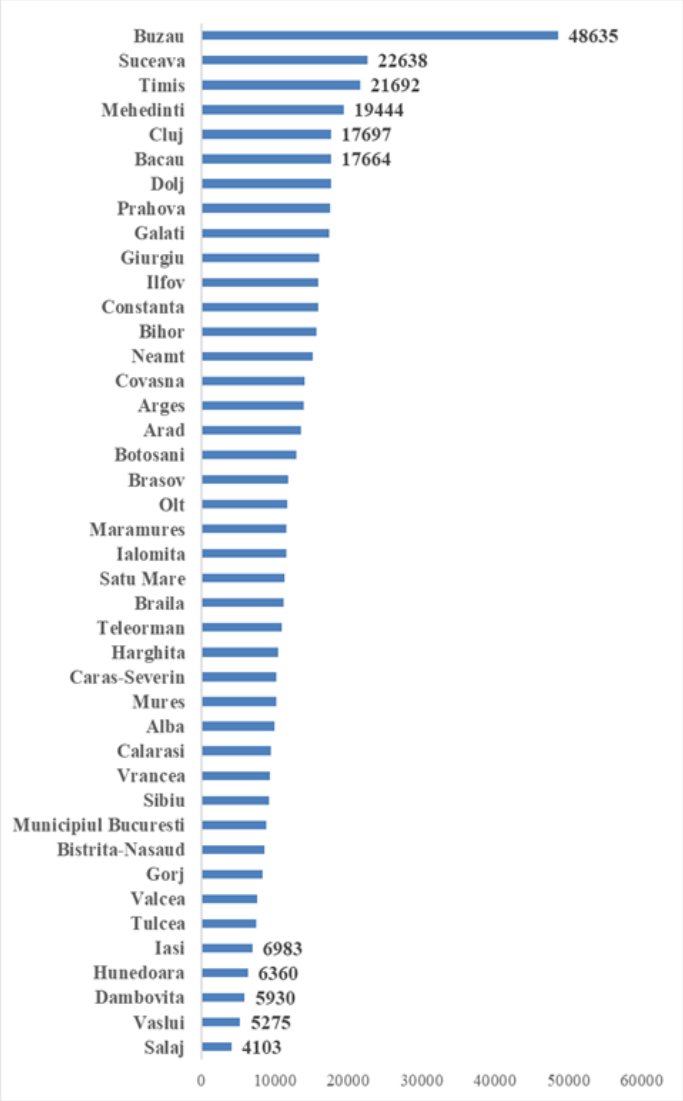
The average length of hospitalization for inpatient episodes for patients with DM in continuous hospitalization was 6.4 days in the period 2014-2024, varying throughout the study period, with values above the average for the period being recorded between 2014-2017 and 2020, 2021, with the maximum value in 2021 (6.72 days). The lowest value is observed in 2024 – 5.85 days. The average duration of hospitalization recorded for patients discharged with a diagnosis of type 1 diabetes was 6.27 days (the maximum duration for patients with the code Diabetes mellitus type 1 with peripheral angiopathy, with gangrene was 11.55 days), and for patients with type 2 diabetes was 6.31 days (the most hospitalized were those coded as Diabetes mellitus type 2 with peripheral angiopathy, with gangrene, 11.75 days).

8. Distribution of hospitalization episodes in patients with DM, by patient's discharge status and the in-hospital mortality rate

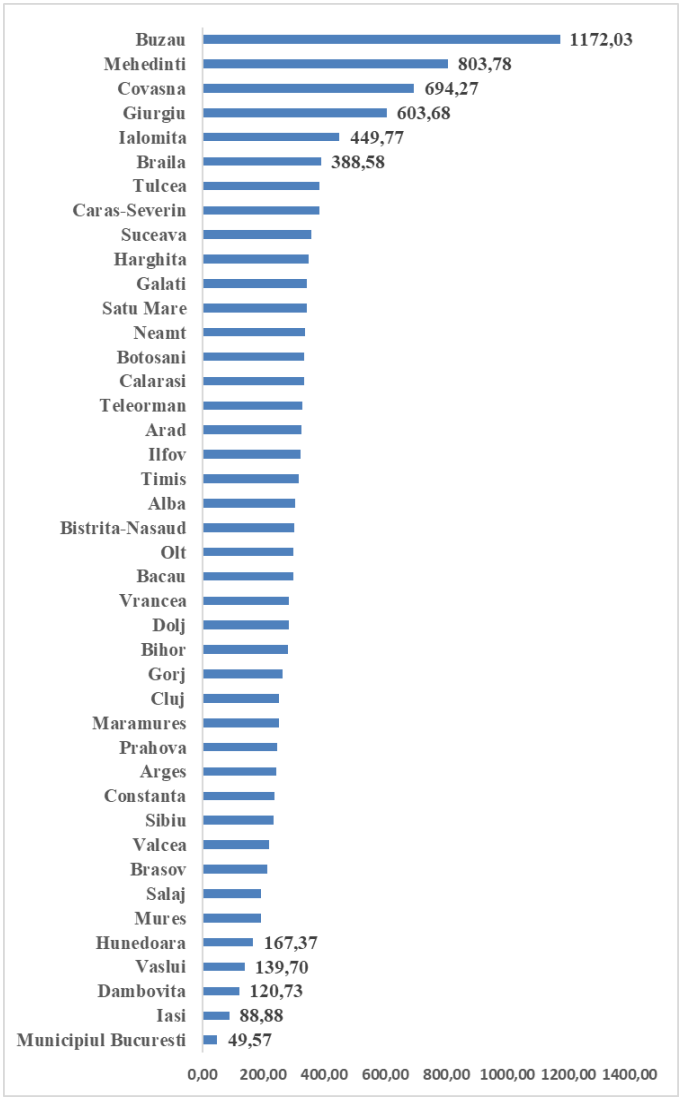
Depending on the patient's condition at discharge, data analysis indicates that of the total number of episodes reported in continuous hospitalization in patients with DM, the majority were discharged in an improved condition (91% of the total). Very small percentages were discharged as inpatients or cured, and a small percentage died (0.87%) – graph no. 8.

The calculated in-hospital mortality rate was 0.87% over the entire study period, with values ranging

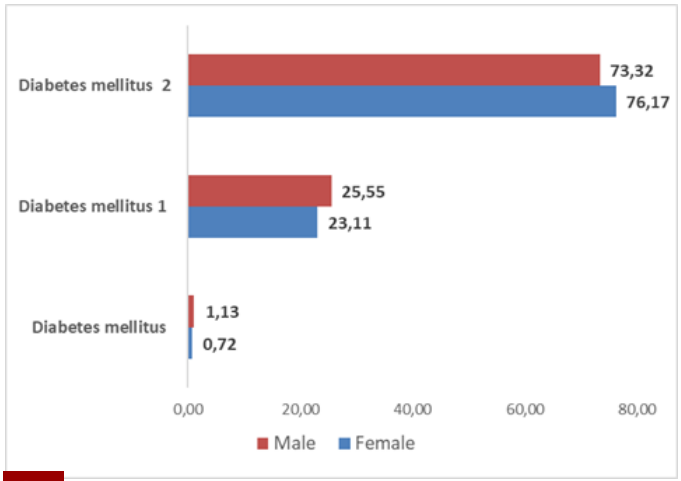
Graph no. 5. Distribution of hospitalization episodes in patients with DM, at local/county level, in Romania 2014 -2024



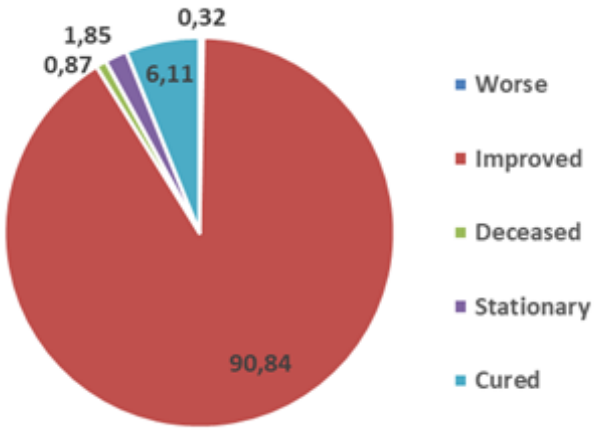
Graph no. 6. Distribution of hospitalization episodes in patients with DM, at local/county level, according to the population (10-year average) 2014-2024



Graph no.7. Hospitalization episodes in patients with DM, depending on the patient's gender and type of diagnosis at discharge, 2014-2024 at national level



Graph no. 8. Hospitalization episodes in patients with DM, by patient's discharge status, in Romania, 2014-2024



between 0.59% in 2014 and 1.91 in 2021. Most of the deceased were elderly (average age 70.84 years), diagnosed with type 2 diabetes mellitus with peripheral angiopathy, gangrene (21.5% of total deceased) or type 2 diabetes mellitus with other specified complications (15%).

CONCLUSIONS

Following the analysis of data from the period 2014-2024 regarding the hospitalization of patients with DM, the following conclusions can be drawn:

- The total number of hospitalization episodes in patients diagnosed with DM during the period 2014-2024 was 553,400 episodes;
- The temporal evolution of the number of hospitalization episodes due to DM was approximately constant until 2020 when hospitalizations were reduced by approximately 2 times; From 2022, the upward slope of hospitalizations resumes, however in a much smaller number compared to the period before 2020. Type 2 diabetes recorded an upward trend in hospitalizations before the pandemic, but during the pandemic it was reduced by approximately 2 times, starting with 2022, a new increase was observed. The halving of hospitalizations during the pandemic is also observed for cases of type 1 diabetes, with the mention that prior to the coronavirus pandemic, the number of hospitalizations was in a marked decrease, approximately 1.5 times fewer cases in 2019 compared to 2014. - Most hospitalizations were recorded in the departments of Diabetes, Nutrition and Metabolic Diseases and Internal Medicine;
- In terms of the main diagnosis at discharge, three quarters of the episodes recorded were for type 2 diabetes mellitus and one quarter were episodes of hospitalization due to type 1 diabetes mellitus; in the case of type 2 diabetes mellitus the most frequent coding for were recorded for: Type 2 diabetes mellitus with diabetic polyneuropathy, Type 2 diabetes mellitus with poor control, Type 2 diabetes mellitus with multiple microvascular complications or Type 2 diabetes mellitus with other specified complications, and for type 1 diabetes the most frequent coding were Type 1 diabetes mellitus with multiple microvascular complications or Type 1 diabetes mellitus with poor control.
- More than half of those hospitalized come from urban areas;
- The spatial distribution analysis of hospitalizations due to this type of diagnosis indicates a predominance in terms of absolute frequency of cases in the South East, South and North East regions, and in the case of values reported to the population of each region, the leaders are South East, South West, West and South; - At the local level, the highest absolute frequencies of the number of hospitalizations were recorded in Buzău, Suceava, Timiș counties, and reported to the population of each county, the first places were Buzău, Mehedinți and Covasna counties;
- Most hospitalizations due to DM belonged to women, with type 2 DM also prevailing in women, while for type 1 diabetes, men recorded the most hospitalizations;
- In terms of patient age, almost three quarters of hospitalizations were recorded in the case of elderly people over 70 years old, but a third also targeted adults over 50 years old, the average age of those hospitalized during this period was 60.24 years old, by gender the average age was 58.41 years old in men and 62 years old in women. For type 1 diabetes the average age was 49.77 years old, and for patients with type 2 diabetes 65.23 years old; - The average duration of hospitalization for these patients was 6.4 days, with a maximum of - 6.72 days in 2021, with variations above the average for the period between 2014-2017 and 2020, 2021. The highest average values of the duration of hospitalization were recorded for patients diagnosed with type 1 diabetes mellitus of 6.27 days (the maximum duration for patients with the code Diabetes mellitus type 1 with peripheral angiopathy, with gangrene 11.55 days), and for patients with type 2 diabetes mellitus of 6.31 days (those coded as Diabetes mellitus type 2 with peripheral angiopathy, with gangrene 11.75 days were hospitalized the most);
- Most of the patients were discharged in an improved condition, and very small percentages were discharged as inpatients or cured, also a small percentage died (0.87%), with the in-hospital mortality rate oscillating between 0.59% in 2014 and 1.91% in 2021. Most of the deceased were elderly (average age 70.84 years) diagnosed with type 2 diabetes mellitus with peripheral angiopathy, with gangrene (one fifth) or type 2 diabetes mellitus with other specified complication

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