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# DESCRIPTIVE STUDY ON THE SITUATION OF MALNUTRITION HOSPITALIZATION EPISODES IN ROMANIA IN THE LAST DECADE

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***Malnutrition is a serious public health problem globally, with a significant negative impact in many aspects from development of children, to the implications on general health, malnutrition correlating with a high rate of complications and infections, with prolonging the length of hospitalization, increasing the risk of vulnerability, reducing the mobility and autonomy of the elderly, as well as increasing mortality, and affecting many people in all countries and regions of the planet, Romania being no exception.***

***Keywords: malnutrition, hospitalization, Romania***

## INTRODUCTION

Malnutrition is defined as an abnormal physiological condition caused by inadequate, unbalanced or excessive consumption of macronutrients, micronutrients or both. [1]. The broad category refers to deficiencies, excesses or imbalances in a person's energy and/or nutrient intake, including three broad groups of conditions: malnutrition (low weight for height), stopping growth (low height for age) and underweight ( low weight for age); micronutrient-related malnutrition, which includes micronutrient deficiencies (lack of important vitamins and minerals) or excess micronutrients; and overweight, obesity, and diet-related noncommunicable diseases (such as heart disease, stroke, diabetes, and some cancers). [2], [3]

The causes of malnutrition are the following: food insecurity, or lack of access to sufficient and accessible food, digestive impairment that prevents the absorption of nutrients (Crohn's disease, celiac disease, etc.), excessive alcohol consumption, mental illness (eg depression, prevalence of malnutrition with 4% higher in these people), inability to provide or prepare food (vulnerable people, for example those with reduced mobility). [4]

Malnutrition affects people in all countries, in 2014 worldwide 1.9 billion people were diagnosed with overweight or obesity, and 462 million were under normal weight. In 2016, 47 million children under the age of 5 in the world were underweight, 14.3 million were severely affected, 144 million were physically underdeveloped in relation to age and 38.3 million were obese or overweight. [3] Most of those affected come from low- and middle-income / per capita countries, and in these countries around 45% of deaths in children under 5 are caused by malnutrition. In these countries there is also an increase in the rates of overweight and obesity in children. The burden of the disease is important and lasting, at individual, family level, as well as for communities and countries, the impact being economic, social, but also medical. [3]

UNICEF data indicates that children are also greatly affected and if the situation with regard to malnutrition has improved in 2019 compared to 2000, in terms of obesity things have worsened. Thus, worldwide if in 2000 there were 199.5 million malnourished children under 5 (32.4%), in 2019 their number decreased to 144 million (21.3%), while in the case of obesity the figures show an increase in its prevalence, compared to 2000 when there were 30.3 million children under 5 years of age obese (4.9%), in 2019 their number increased to 38.3 million (5.6%). [5] The countries most affected by malnutrition in young children are the poor countries of Africa and South Asia, with a prevalence of over 30% compared to the global average of 21.3%. Central Europe recorded a prevalence of 7.7% in 2019. [5]

In terms of obesity, the prevalence is higher in 2019 compared to the global average of 5.6% in areas such as the Middle East and North Africa (11%), Central and Central Europe (10.8%) and North America (8.9%). [5] So, although the situation has improved in recent years, statistics still show high percentages of malnourished people (10.8% in 2018, 820 million people), 22% of children under 5 are underdeveloped by age, 9% of the world's population (697 million) are at risk for severe food insecurity (insufficient food), with one in four people falling into this category. [6] In Europe, 33 million people are affected by malnutrition, one in 5 children hospitalized, one in four patients hospitalized, one in three patients with neoplasia, one in three people in care homes, one in three elderly people living independently. The costs associated with this condition are estimated at 170 billion euros / year in European countries, while the cost of caring for a malnourished patient is 2-3 times higher than in the case of a normal weight person. [7] In Romania, the data (Global Nutrition Report, 2021) indicate that the prevalence of malnutrition in children under 5 was 12.8%, while 8.3% of them were obese, the existing data not allowing a comparative analysis with the previous period. In the case of adults, it is shown that 21.6% of women and 23.4% of men were obese, the prevalence of obesity in Romania being lower compared to the regional one for women (23.3%) but higher for men (22.2%). [8]

Given these data, which indicate that we are facing a serious public health problem and the negative impact of malnutrition is an important one in many aspects from development of children, the implications for general health, malnutrition correlating with a high rate of complications and infections, prolonging hospitalization, increasing the risk of vulnerability, reducing mobility and

autonomy of the elderly, and increasing mortality, National School of Public Health, Management and Professional Development in Health, Bucharest (NSPHPDHB) conducted a study on the situation of hospitalization episodes for malnutrition patients hospitalized in public hospitals in Romania, in the period 2008-2018, the results will be presented below.

## OBJECTIV

Identification at national, regional and local level of the geographical distribution of hospitalization episodes in the case of malnutrition patients, as well as the temporal evolution of their number, in the period 2008-2018.

## METHODOLOGY

A descriptive, retrospective study was performed, which used data from the National DRG Database, data reported in a continuous hospitalization regime by Romanian hospitals in a contractual relationship with the National Health Insurance House. In accordance with the provisions of the Order. no. 1782/576/2006 on the registration and statistical reporting of patients receiving medical services in continuous hospitalization and day hospitalization, with subsequent completions and modifications, NSPHMPDHB collects and processes the minimum set of patient-level data for cases treated in continuous and day hospitalization. The data used in this study were reported in the period 2008-2018. The aim was to analyze the data on hospitalization episodes in the case of malnutrition patients in Romania, in the aforementioned hospitals (hospitalizations in continuous hospitalization). Data were selected using the ICD-10-AM classification, and records were extracted and analyzed from the observation sheets that most frequently had as primary diagnosis one of the codes: E40-46, including: E40- Kwashiorkor (Severe malnutrition with nutritional edema with skin and hair depigmentation), E41-Nutritional marasmus (Severe malnutrition with marasmus), E42-Kwashiorkor marasmus (Severe protein-energy malnutrition [as in E43]: - intermediate form-with signs of both Kwashiorkor and marasm), E43-Severe, unspecified protein-energy malnutrition (severe weight loss [emaciation] in children or adults, or lack of child weight gain, reaching an observed weight that is at least 3 standard deviations below the mean value for the population reference (or similar loss expressed by other statistical methods), Starvation edema), E44-Mild to moderate protein-energy malnutrition, E45-Developmental delay due to protein-energy malnutrition (Nutritional: stature insufficiency-growth interruption, Mental retardation due to malnutrition) and E 46-Unspecified protein-energy malnutrition. In accordance with the provisions of Law 190/2018 and of Art. 13 of EU Regulation no. 679/2016, personal data are deleted at the time of transmission to NSPHMPDHB, and the identification of persons for the purpose of analysis is based on encrypted ID. The age of the patients was calculated in years of age, as the difference between the date of hospitalization and the date of birth. The data were processed using the SQL Server Management Studio Express 2005 software, further processing and analysis was performed using SPSS and Excel. 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 set of data reported in the DRG system by hospitals. The interpretation and presentation were done in the form of tables and graphs.

## RESULTS

Following the processing and analysis of data from the DRG, their interpretation was performed in relation to a series of demographic variables and socioeconomic characteristics (sex, age, area of residence, length of hospitalization, in-hospital mortality rate, state of discharge) following the geographical distribution and temporal evolution of hospitalization episodes for patients with malnutrition, from all hospitals in our country, between 2008-2018.

### 1. Total number of hospitalization episodes for malnutrition patients, registered in Romania, in 2008-2018

The total number of episodes of continuous hospitalization for patients with malnutrition registered in Romania in the period 2008-2018 was 209383 episodes, of which 54.5% (130134 episodes) were recorded in children (0-18 years), the rest in adult patients (24.7% in people under 65 and 21% in those over 65). A number of 154602 patients were hospitalized during that period with this diagnosis, the average number of hospitalization episodes/patient being 1.35.

### 2. The temporal evolution of hospitalization episodes for malnutrition patients, in Romania, in the period 2008-2018

The temporal evolution of hospitalization episodes for patients with malnutrition during this period can be observed in graph no.1. The evolutionary trend was a constantly increasing one, the value of the figure registered in 2018 being 3.7 times higher than the value observed in 2008. The only year in which a decrease in the number of hospitalizations was observed was the year 2014, after which the ascending trend resumed.

### 3. Distribution of hospitalization episodes for malnutrition patients, depending on the discharge department and diagnosis in Romania, during 2008-2018

Most malnutrition patients were discharged from the pediatric wards (44% of all hospitalization episodes), internal medicine (19%), gastroenterology (10%), medical oncology (7%) or endocrinology (7%). As the main diagnosis at discharge, the following were most frequently recorded: Mild protein-energy malnutrition (41% of hospitalization episodes), moderate protein-energy malnutrition (34%), unspecified protein-energy malnutrition (14%) or severe protein-energy malnutrition, unspecified (9%). A small number of episodes were diagnosed at discharge as Developmental delay due to protein-energy malnutrition (2632 episodes), nutritional marasmus (561 episodes) or Kwashiorkor's disease (219 episodes).

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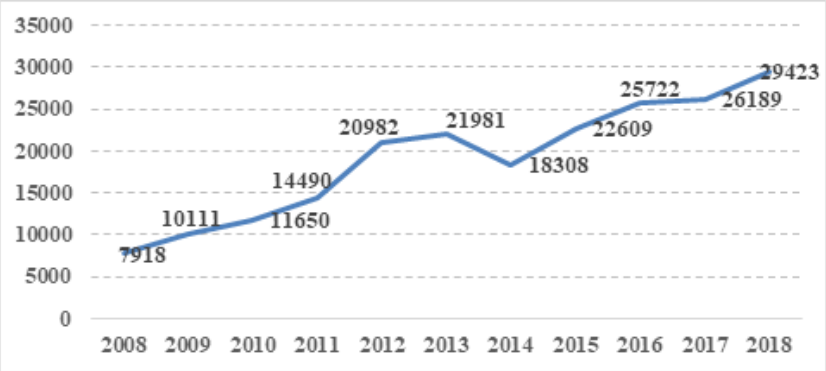
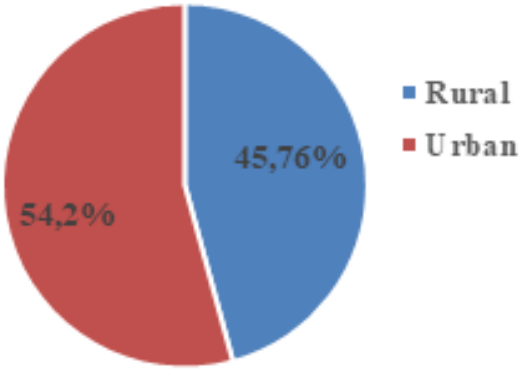
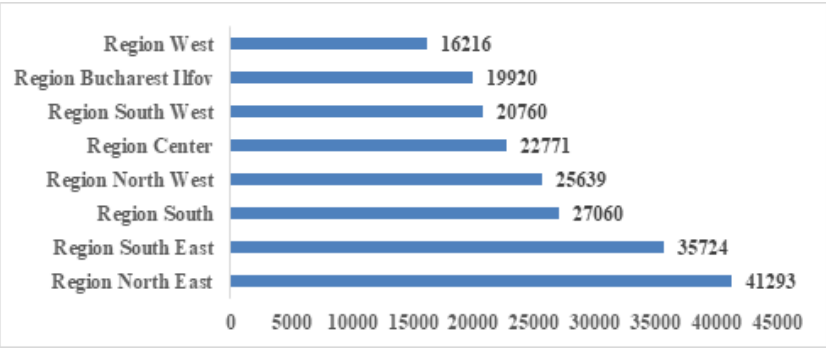
***Graph no. 1 Evolution of the number of episodes reported in continuous hospitalization, in malnutrition patients, registered in the period 2008-2018, at national level***



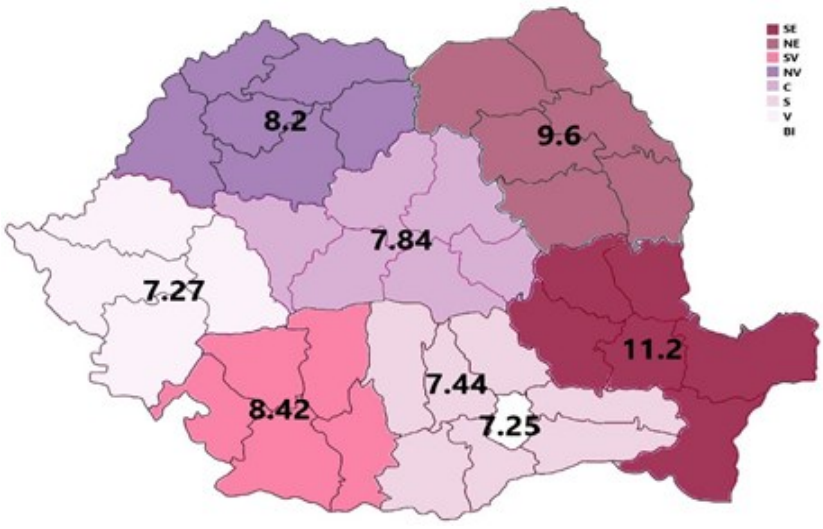

***Graph no.2 Distribution of hospitalization episodes for malnutrition patients, by patient's residence, in Romania, during 2008-2018***




***Graph no.3 Distribution of hospitalization episodes for malnutrition patients, at regional level in Romania, during 2008-2018***




***Graph no. 4 Distribution of hospitalization episodes for malnutrition patients, by population, at regional level, in Romania, between 2008-2018***




**4. Distribution of hospitalization episodes for malnutrition patients, at regional and local level, in the period 2008-2018**

The analysis of data by areas of residence highlights the fact that most episodes of hospitalization were recorded in the case of patients from urban areas (54%) - graph no. 2.

At the regional level, most episodes of hospitalization for malnourished patients occurred during the study period in the North East (16% of the national total) and South (13%) regions. The Central and West regions recorded the fewest hospitalization episodes through this main diagnosis, with approximately 8% each - graph no.3.

By the number of inhabitants, the descending order of the regions that registered episodes of hospitalization for malnutrition patients was: South East region (11.2 episodes/10,000 inhabitants), North East region (9.6 episodes/10,000 inhabitants), region South West (8.42 episodes/10,000 inhabitants), North West region (8.2 episodes/10,000 inhabitants), Center region (7.84 episodes/10,000 inhabitants), South (7.44 episodes/10,000 inhabitants), West 7.27 episodes/10,000 inhabitants) and Bucharest Ilfov (7.25 episodes/10,000 inhabitants) - graph no. 4.

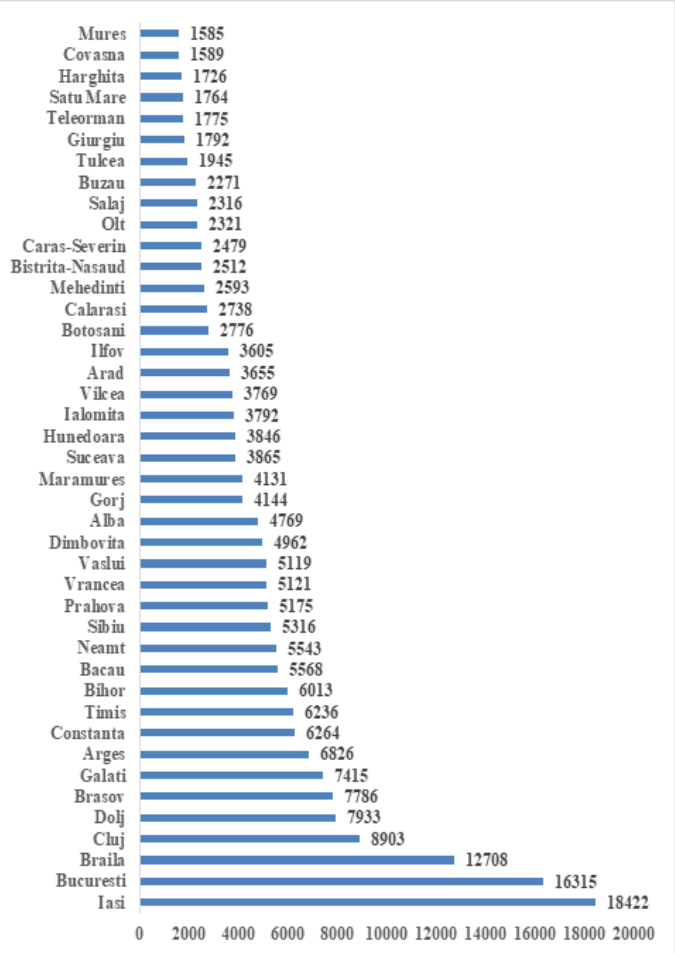
At local level, most hospitalization episodes were registered between 2008-2018 in the counties of Iași, Brăila and Bucharest (each exceeding 10,000 hospitalization episodes), at the opposite pole being the counties of Mureș, Covasna, Harghita, Satu Mare, Teleorman, Giurgiu and Tulcea with less than 2000 episodes of hospitalization (graph no.5). The largest increases in the number of hospitalization episodes in 2018, compared to 2008 were recorded in the counties of Brăila, Iași, Timiș and Vrancea, compared to counties such as Sibiu or Dolj where the increase was very small (0.55 respectively 0.68 times).

Compared to the population of each county, a change in the ranking can be seen from graph no.6, on first places being Braila (31.74 episodes/10000 inhabitants) and Iași (18.73 episodes/10000 inhabitants), on the last places Mureș and Teleorman.

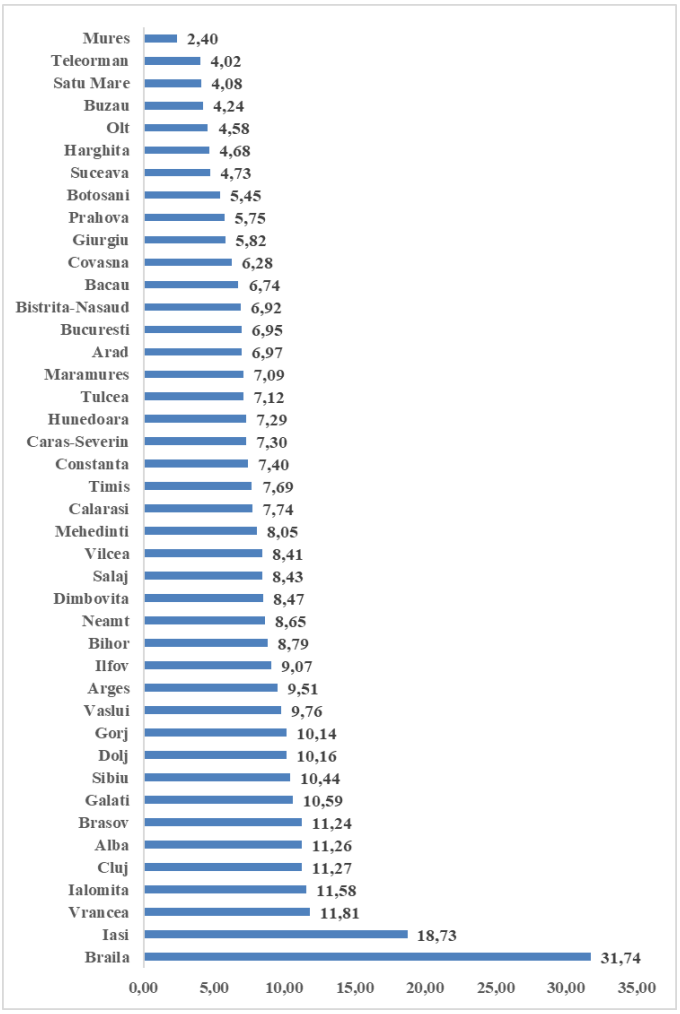
**5. Distribution of hospitalization episodes in patients with malnutrition, by patient sex**

Of the total number of malnutrition hospitalization episodes recorded during the study period, most belonged to women, about 55% - graph no.7.

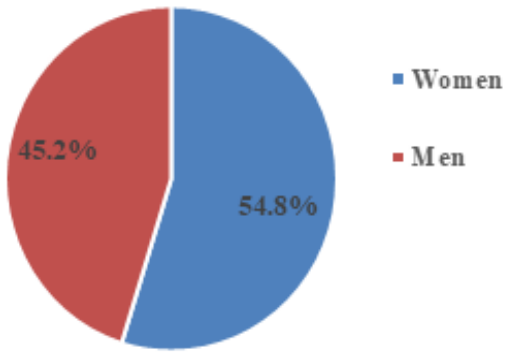
***Graph no. 5 Distribution of hospitalization episodes for malnutrition patients, at local / county level, in Romania, during 2008-2018***



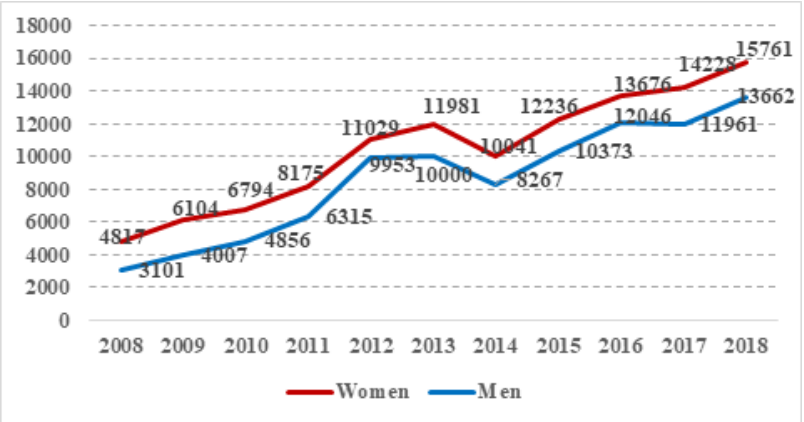

***Graph no. 6 Distribution of hospitalization episodes for malnutrition patients, at local / county level, by population of each county, during 2008-2018***




***Graph no. 7 Total number of episodes reported in continuous hospitalization, for malnutrition patients, by patient's sex, in the period 2008-2018, at national level***



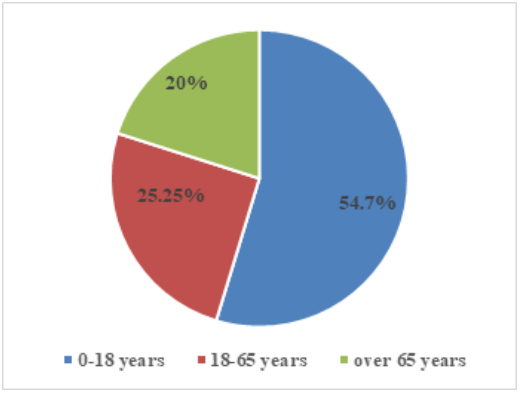

***Graph no. 8 Evolution of the number of episodes reported in continuous hospitalization, in malnutrition patients, by patient's sex, during 2008-2018, at national level***



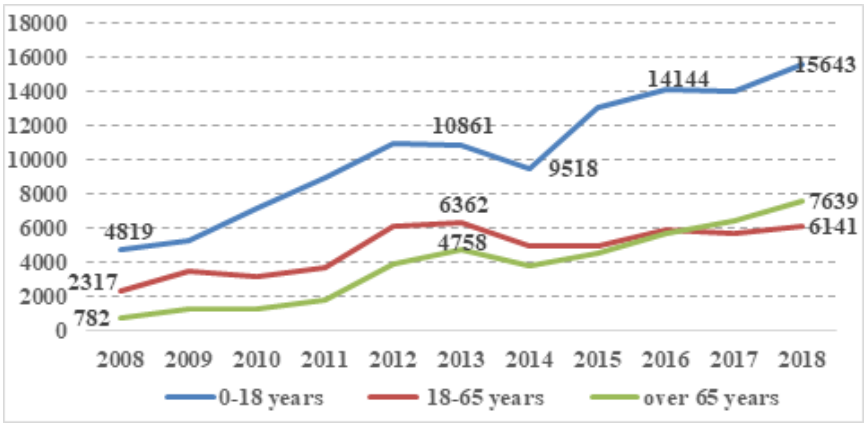

As evolution over time, there is an increase in the number of hospitalization episodes throughout the study period, for both sexes, the increase being more pronounced in recent years. Women recorded more episodes of hospitalization each year, however compared to the initial year, in 2018 the increase was higher for men (4.4 times, compared to an increase of 3.3 times for women) - graph no. 8.

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

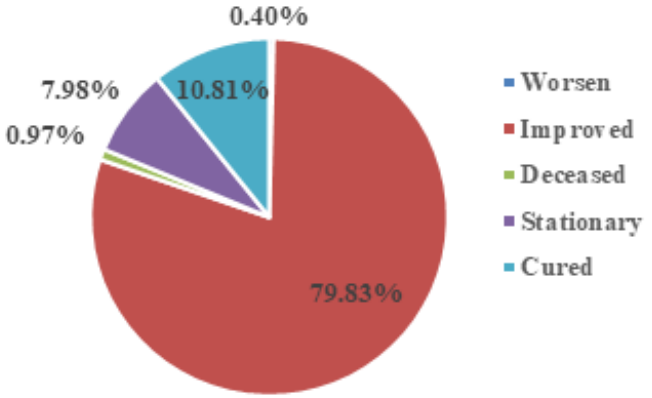
***Graph no.9 Number of episodes reported in continuous hospitalization, in malnutrition patients, by patient's age, in the period 2008-2018, at national level***




***Graph no. 10 Evolution of the total number of episodes reported in continuous hospitalization, in malnutrition patients, by patient's age, in 2008-2018, at national level***




***Graph no. 11 Number of hospitalization episodes for malnutrition patients, by the state of discharge of patients, in Romania, in the period 2008-2018***




The analysis of data by age groups indicates that at national level, for the entire study period, most episodes of hospitalization were recorded in children. Thus, 54.7% (114491 episodes) of the total number of hospitalization episodes were recorded in children (0-18 years), the rest in adult patients (25.25% in people under 65 years and 20% in those over 65 years old) - graph no.9. Among children, the number of hospitalization episodes by age groups is similar, with slightly more episodes in young children (approx. 35% of total hospitalizations in children, in the group 1-5 years and the group 0-1 year). In the category of people over 65, the highest percentages were held by people belonging to age groups up to 80 years (approximately 24% of the total registered for those over 65).

The trend was steadily increasing, until 2014, with approximately a doubling of the number of episodes for children and adults, while for the elderly the increase was higher (4.9 times). Starting with 2015, there was a new increase in the number of these episodes, so that at the end of the period there are increases of about 3 times in children, 2.6 times in adults and 9.7 times in the elderly over 65 years - graph no.10.

## 7. Distribution of hospitalization episodes for malnutrition patients, according to the average length of hospitalization

The average length of hospitalization in the case of malnutrition patients in continuous hospitalization was in the period 2008-2018 of 6.12 days, varying throughout the study period, the maximum value being observed in 2008 and 2014 (6.49 days) it decreased in 2018 to 5.63 days, the rest of the years it varied around the figure 6. The highest average values of hospitalization were recorded in the case of malnutrition patients admitted to the plastic and reparative surgery wards (19 days), psychiatry, acute/chronic (15.5 days) or radiotherapy (11.59 days). The hospitals that recorded the highest values of hospitalization time were those in the counties of Neamț (73 days), Mureș (28 days), Brașov (27 days). As a type of pathology, the severe forms record the highest values of hospitalization, so patients with the main diagnosis of marasmus Kwashiorkor had an average hospitalization of 11.39 days, those with nutritional marasmus - 9.31 days, patients with Kwashiorkor - 8.94 days or those with severe, unspecified protein-energy malnutrition - 8.68 days.

## 8. Distribution of hospitalization episodes for malnutrition patients, depending on the patient's discharge status and in-hospital mortality rate

Depending on the patient's discharge status, the data analysis indicates that out of the total number of episodes reported in continuous hospitalization in patients with malnutrition, most patients were discharged in an improved state (79.8% of the total) or cured (10.8%). Small percentages, 0.4% had an aggravated condition at discharge or died (1%) - graph no. 11.

The calculated in-hospital mortality rate was 0.96% for the entire study period, with a slow upward trend since 2008, from 0.16% to 1.36% in 2016 or 1.32 % in 2017. Most deaths were recorded in hospitals in the counties of Brăila, Brașov and Bacău, in adults (44.7% of all deaths) and the elderly (52.3%).

## CONCLUSIONS

Following the analysis of data from the last decade on the hospitalization of malnutrition patients, the conclusions that emerge are the following:

- The number of hospitalization episodes for patients diagnosed according to the National DRG with one of the codes E 40-E46, in the period 2008-2018, was 209383 episodes, returning on average about 1.35 hospitalization episodes/patient;

- The temporal evolution of the number of hospitalization episodes due to malnutrition during this period was constantly increasing, the value registered in 2018 tripling compared to 2008;

- Most hospitalizations were registered in the departments of pediatrics, internal medicine, gastroenterology, medical oncology or endocrinology;

- The most common diagnoses at discharge were: Mild protein-energy malnutrition, Moderate protein-energy malnutrition (one third of the total number), Unspecified protein-energy malnutrition (more than one tenth) or Severe protein-energy malnutrition, unspecified (almost one tenth of the total);

- More than half of those hospitalized come from urban areas; the analysis of the spatial distribution of malnutrition hospitalizations indicates a predominance in terms of the absolute frequency of cases in the North East and South regions, while by population the leading regions are: South East and North East; locally, the counties that register in this period the highest absolute frequencies of the number of hospitalizations were Iasi, Brăila and Bucharest (each exceeding 10,000 hospitalization episodes), and compared to the population of each county, the leaders are Brăila (with almost double the value of the next county in descending order) and Iasi; - More than half of the number of hospitalizations due to malnutrition belonged to women, the evolution over time being upward for both sexes, at the end of the study it was observed that compared to the initial value the increase was higher for men (4.4 times, versus 3.3 times for women);

- In terms of patients age, most hospitalizations were observed in children (slightly more than half of the total, especially young children, 0-1 years and up to 5 years), a quarter belonged to adults and one-fifth to the elderly; The evolution of the number of hospitalizations was constantly increasing, with one exception, in 2014 when there was a slight reduction, starting with the following year the increase resumed, the highest increase compared to the initial year being observed in the case of the elderly, an increase of almost 10 times;

- The average length of hospital stay for the entire period was 6.12 days, with a maximum of 6.49 days and a minimum of 5.63 days, with the longest hospital stays being in the plastic and repair surgery departments, psychiatry, acute/chronic or radiotherapy and especially for patients with more severe forms of impairment, patients with a primary diagnosis of marasmus Kwashiorkor, nutritional marasmus, patients with Kwashiorkor or those with severe, unspecified Protein-Energy Malnutrition;

- 90% of hospitalization episodes finished with improved or cured discharge status, the unfavorable cases in terms of the patient's condition being extremely few (less than half percentage aggravated and approximately one percent dead); deaths during hospitalization varied within low limits, between 0.16-1.36% and mainly affected the elderly.

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