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CLINICAL AND ETIOLOGICAL STRUCTURE OF NOSOCOMIAL INFECTIONS IN BULGARIA FOR THE PERIOD 2011-2016

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Abstract. *Despite their partial diagnosis and registration, nosocomial infections are widespread in Bulgaria and they are of great healthcare, social and economic importance for the society. Statistical processing of official information for the period 2011-2016 shows that the incidence of registered NI among hospitalized patients in Bulgaria is below 1%. In the clinical structure of NI in the above mentioned period, the infections of the surgical site are leading with a prevailing share of 20.67%. S. aureus (19.74%) and E. coli (19.33%) have the highest incidence in the etiological deciphering of infections of the surgical site. Leading etiological agents of lower respiratory tract infections (including pneumonia) in Bulgaria are Acinetobacter spp. (24.12%) and Pseudomonas spp. (20.18%). Urinary tract infections have a relative share of 15.08% in the clinical structure of NI. They are primarily caused by E. coli (28.95%). In bloodstream infection, coagulase-negative staphylococci (S. epidermidis prevailing) are isolated in 30.58% of the cases.*

Key words: *nosocomial infections, distribution, clinical structure, causative agents*

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The term „hospital-acquired infections“ is equivalent to the terms „nosocomial infections“ (NIs) and „infections related to medical treatment“. Hospital-acquired infections include: infections acquired in hospital by patients who were admitted for a reason other than that infection and infections acquired by the medical staff of the facility or third parties while taking care of patients. A hospital-acquired infection is manifested by the appearance of local or systemic signs of infection as a reaction to the presence (invasion) of microorganisms or their toxins [1].

The criteria for the establishment of hospital-acquired infections are based on clinical and laboratory data and are adapted to the definitions applied by the Center for Disease Control and Prevention (CDC). They are the basis of the Decree No. 3 of May 8, 2013, for the approval of a medical standard on the prevention and control of nosocomial infections [1].

The aim of the present study is to show the relative share of the leading clinical forms, their etiological interpretation and the morbidity (in 100 treated patients) of nosocomial infections in the hospitals in Bulgaria during the period 2011-2016.

MATERIAL AND METHODS

The epidemiological survey uses data from own studies and official data from the „hospital-acquired infections“ automated information system for the period 2011-2016, which covers all hospitals in Bulgaria (with the exception of the Military Medical Academy Hospital).

The complex epidemiological method, which includes the epidemiological analysis method as well, has been applied in analysis and interpretation of the collected information.

Statistical processing of the data is based on methods of alternative analysis – assessment and comparison of relative shares at a level of significance P = 0.05.

RESULTS AND DISCUSSION

Despite their partial diagnosis and registration, nosocomial infections in Bulgaria are widespread. They are of great healthcare, social and economic importance for the society.

Statistical processing of official information for the period 2011-2016 shows that the incidence of registered NI among the hospitalized patients in Bulgaria is below 1% (the hospitalized patients for the period are 2,156,916 on average per year and the NIs registered as an absolute number are 18,261 on average per year).

National or multicenter studies conducted by the European Center for Disease Prevention and Control (ECDC) for the period 2011-2012 indicate that the most common clinical NI in the European Union countries is pneumonia and other infections of the lower respiratory tract. As far as etiological deciphering is concerned, the same studies indicate that the primary causative agents for the onset of infections in the hospital units are: *E. coli* (15.9%), *S. aureus* (12.3%), *Enterococcus spp.* (9, 6%), *Pseudomonas aeruginosa* (8.9%), *Klebsiella spp.* (8.7%) and coagulase-negative staphylococci (CNS) (7.5%) [2].

Figure 1 shows the clinical structure of NI in Bulgaria for the period 2011-2016. According to the data obtained by processing officially registered NIs, surgical site infections with 20.67% have the main share, followed by two other indicative clinical manifestations – lower respiratory tract infections (including pneumonia) with 19.41% and urinary tract infections with 15.42%. The high relative share – 21.73% of „other" clinical forms is associated with the dropout of the upper respiratory tract infection registration as a separate clinical form over the period considered. The indicative clinical form – primary sepsis is with 6.74% relative weight.

Figures 2, 3, 4 and 5 show the etiological deciphering of pneumonia and other lower respiratory tract infections; urinary tract infections; surgical site infection and bloodstream infection, respectively. These are the clinical forms that determine the healthcare, social and economic significance of the NI. 76.17% of pneumonia and other infections of the lower respiratory tract are caused by *Gram-negative* microorganisms for the period 2011-2016. Leading etiological agents are *Acinetobacter spp.* with 24.12% relative share, *Pseudomonas spp.* with 20.18% and *Klebsiella spp.* with 14.09%. *Candida spp.* was isolated in 6.57% (Fig. 2).

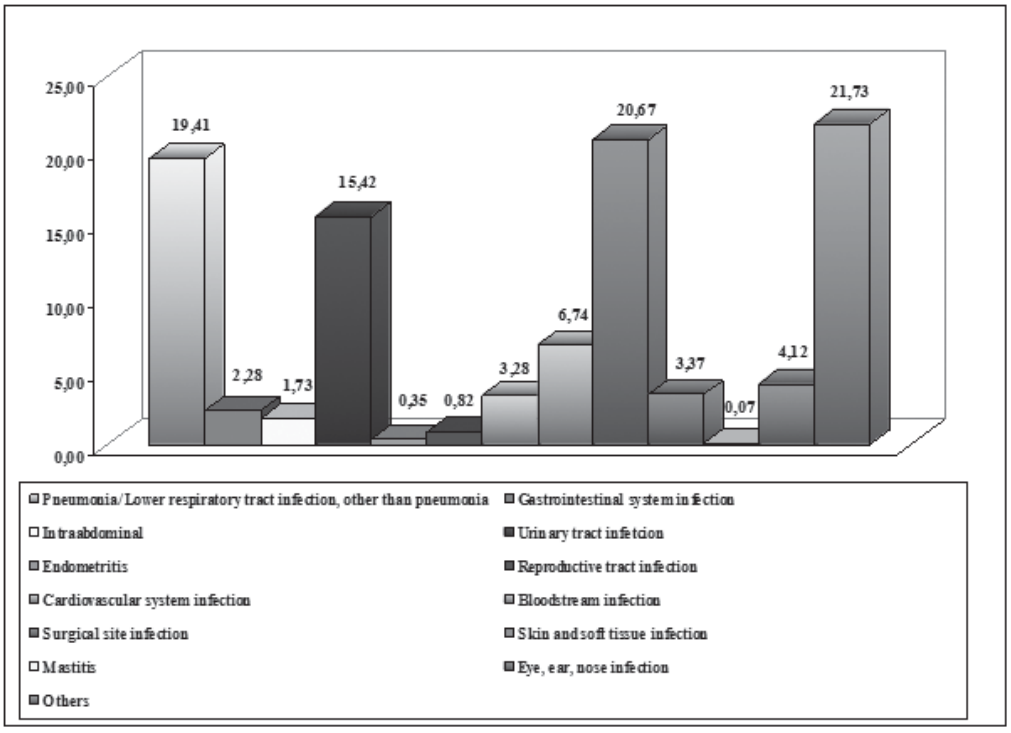

Fig. 1. Major and Specific Types of Nosocomial Infections (%), Bulgaria (2011-2016), n = 109,568

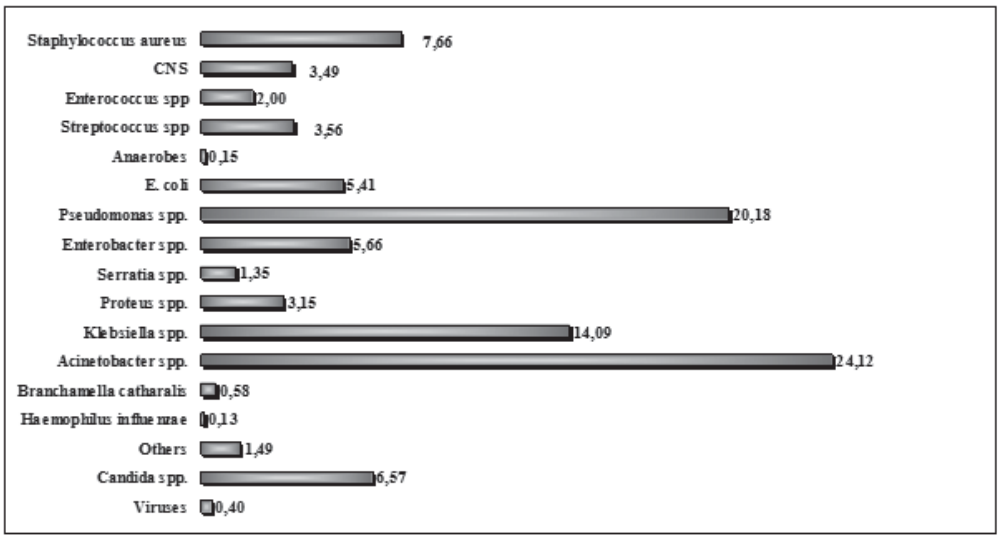

Fig. 2. Causative Agents of LRTI /Pneum (%), Bulgaria (2011-2016), n = 14,866

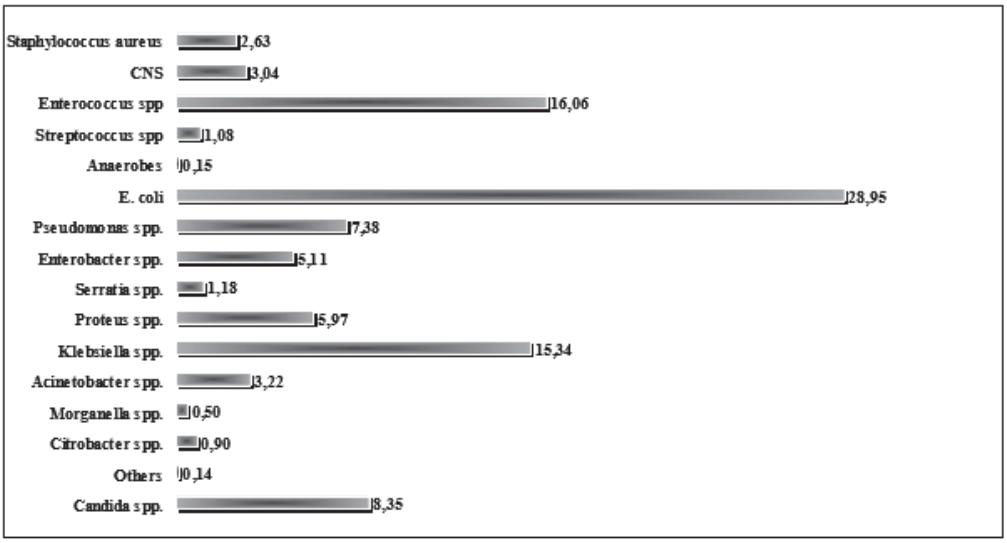

Fig. 3. Causative Agents of UTI / Urinary tract infection (%), Bulgaria (2011-2016), n = 15,506

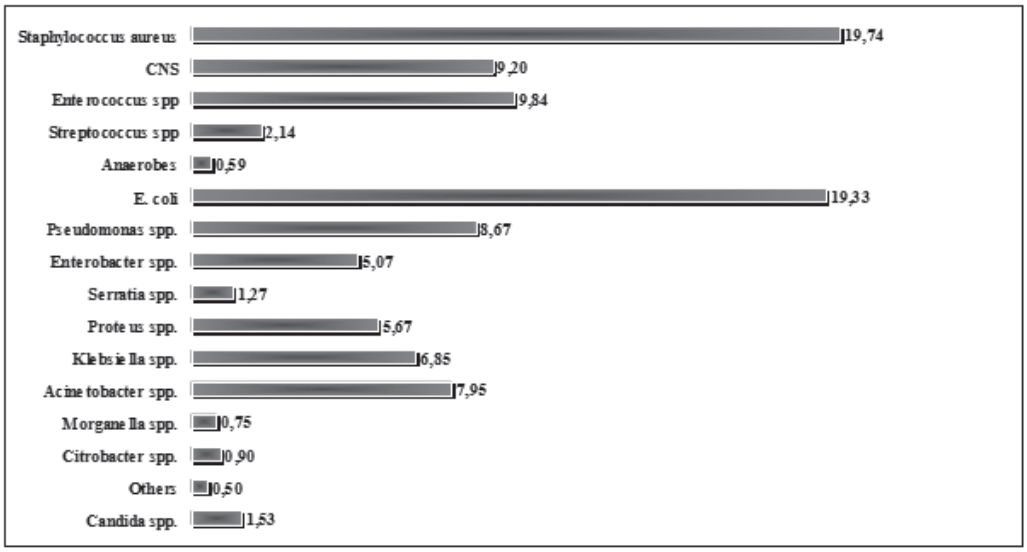

Fig. 4. Causative Agents of SSI (%), Bulgaria (2011-2016), n = 20,715

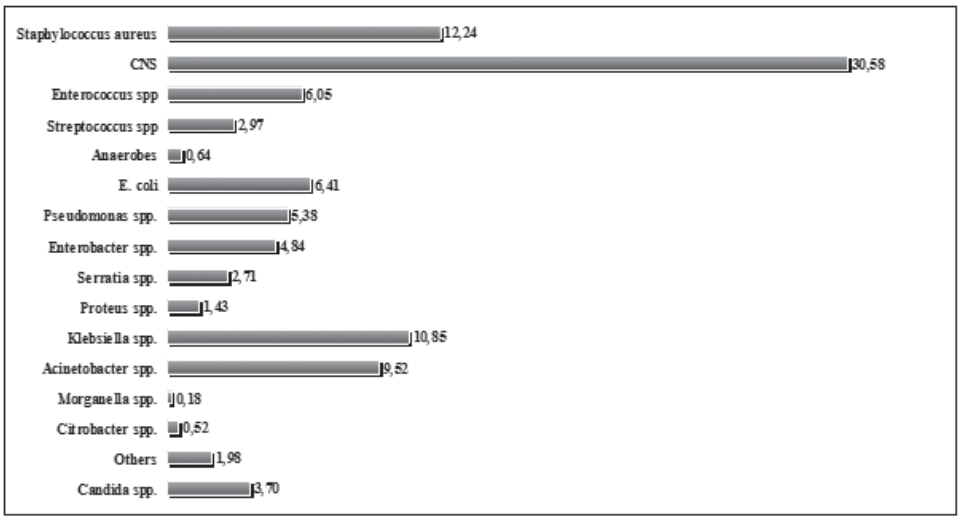

Fig. 5. Causative Agents of BSI / Bloodstream infection (%), Bulgaria (2011-2016), n = 6,710

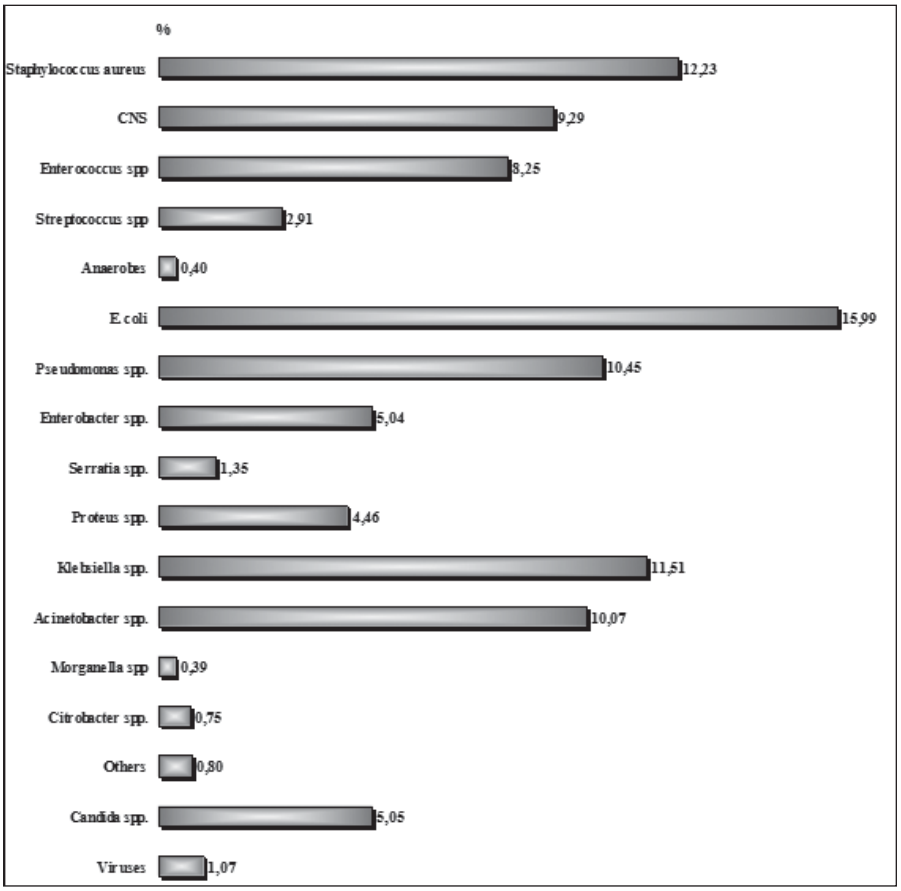

Fig. 6. Causative Agents of Nosocomial infections (%), Bulgaria (2011-2016), n = 76,684

The causal relationship to respiratory equipment can rarely be proven; it is done exclusively according to time, i.e. the patient was in artificial ventilation during the last 48 hours before the onset of pneumonia [1]. The data from our study show that 42% of the lower respiratory tract infections (including pneumonia) are associated with respiratory equipment (1,589 from 3,514 for 2016).

The etiological structure of urinary tract infections (NIUT) over the period shows *E. coli's* leading role in the development of this clinical form – 28.95% relative share, followed by *Klebsiella spp.* – 15.34%. For the period 2011-2016 we should also note the high relative share of *Enterococcus spp.* – 16.06% (Fig. 3). Most authors point out that the major causes of NIUT, especially in catheterized patients, are Gram-

negative bacteria and enterococci, which are often part of the intestinal micro flora and are present in faeces (endogenous infection) [3, 4, 5]

Infection of the surgical site is exclusively related to the surgical wards. For the period 2011-2016, *S. aureus* had the highest incidence – 19.74% of the cases, followed by *E. coli* – in 19.33% of the cases. Agents next of importance are *Enterococcus spp.* (9.84%) and *Pseudomonas spp.* (8.67%) (Fig. 4).

Leading etiological agents of the most severe nosocomial clinical form – bloodstream infection – are coagulase-negative staphylococci (CNS) (with the prevalence of S. epidermidis), which are isolated in 30.58% ± of cases, followed by S. aureus – 12.24%% and Klebsiella spp. – 10.85%. Gram-negative nonfermentative bacteria are isolated in 16% of the cases (Acinetobacter spp leading with 9.52%). Diagnosis of clinical sepsis is found in about 5% of cases (Fig. 5).

The etiological structure of registered NIs in Bulgaria for the period 2011-2016 shows that the most isolated microorganisms of clinical material are *E. coli* (15.99%) and *S. aureus* (12.23%) (Fig. 6).

In conclusion, we have to mention that despite the partial registration of NI in Bulgaria, our results confirm the data cited in the ECDC reports concerning the leading clinical forms and etiological structure as a whole and on clinical setting.

The analysis of the presented data gives grounds for making the following important conclusions:

The prevalence of NI among the hospitalized patients in Bulgaria for the period 2011-2016 is 0.8%.

In the clinical structure of NI in Bulgaria for the period under review, infections of the surgical site lead with 20.67% relative share, followed by two other indicative clinical forms – infections of the lower respiratory tract – 19.41% and urinary tract infections – 15.42%.

Leading etiological agents of pneumonia and other infections of the lower respiratory tract in Bulgaria are *Acinetobacter spp.* with 24.12% and *Pseudomonas spp.* with 20.18% relative weight.

Urinary tract infections in Bulgaria are primarily caused by *E.coli* – in 28.95% of the cases reported.

S. aureus, isolated in 19.74% of the cases and *E. Coli*, isolated in 19.33% of the cases have the highest incidence in etiological deciphering of the infections of surgical site.

Leading etiological agents of primary sepsis in Bulgaria for the reviewed period are coagulase-negative staphylococci (with the prevalence of S. epidermidis), which are isolated in 30.58% of the cases.

The etiological structure of registered NIs in Bulgaria for the period 2011-2016 shows that the most commonly isolated microorganisms of clinical material are *E. coli* and *S. aureus*.

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