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Epidemiological Characteristics of Meningococcal Meningitis in the Area of Zenica-Doboj Canton in Period from 2008 to 2012

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ABSTRACT

Introduction: Meningococcal meningitis now represents a significant public health problem, not only in developing countries but also in developed ones. The disease usually occurs sporadically, and much less in smaller epidemics. **Material and methods:** We retrospectively analyzed the epidemiological characteristics of meningococcal meningitis in the area of Zenica-Doboj Canton in the five-year period from 2008 to 2012th. In total there were 38 reported and hospitalized patients, with an average of 7-8 patients per year. **Results:** Most commonly disease occurred in infants and young children (28.9%). The highest number was recorded in 2011, 10 cases or (26.3%). Most patients in the monitored period were registered in the municipality of Zenica–12 cases (31.6%) and Zepce 8 cases (21.1%). All hospitalized patients were sporadic cases, there has never been an epidemic in the observed period. **Conclusions:** Epidemic Meningitis is a very serious disease and a significant public health problem that requires a serious medical scientific approach for its resolution, primarily in finding adequate vaccine and its administration.

Key words: meningococcal meningitis, epidemiological characteristics, Zenica-Doboj Canton.

1. INTRODUCTION

Meningococcal meningitis represents even now a significant public health problem, not only in developing countries but also in developed ones. The disease usually occurs sporadically, and much more rare in smaller epidemics. After the introduction of routine vaccination against *Haemophilus influenzae* type b, and frequent application of vaccines against *Streptococcus pneumoniae*, *Neisseria meningitidis* is becoming a leading cause of meningitis in children. So in the U.S. *Neisseria meningitidis* is a leading cause of bacterial meningitis in children and young adults, with a mortality rate of 13%, and the second leading cause of bacterial meningitis in adults (1).

Meningococci based on the capsular polysaccharides antigen differences are divided into 13 serogroups, while the most of the infections are caused by serogroup A, B, C, Y W135 (2). The disease is in most cases manifested as meningococcal meningitis, but it can present clinically as sepsis or sepsis with meningitis. It is usually a case of severe or moderately severe clinical presentations. Rare cases of fulminant meningococcal sepsis have the highest mortality rate (3). It is treated by modern methods of care in the intensive care unit. As antimicrobial therapy

most often are used third-generation cephalosporins (4). According to the Federal Office of Public Health in the above mentioned period are registered 105 cases (5).

2. GOALS

The main goal of this study is to present the epidemiological characteristics variation of epidemic meningitis in the area of Zenica-Doboj Canton in the five year period (2008 to 2012), to determine the prevalence of the disease among the population, and to determine the occurrence of illness in relation to age, gender, place of residence, integrity and socioeconomic status of the family and the importance of treatment according to modern principles of intensive care.

3. MATERIAL AND METHODS

We retrospectively collected and analyzed epidemiological and clinical data of patients who are due to meningococcal meningitis treated at the Infectious Diseases Department of the Cantonal Hospital in Zenica and registered at the Cantonal Public Health Institute Zenica, in the period from January 1, 2008 to December 31, 2012. The study included the occurrence and trends of epidemic meningitis

among residents of Zenica-Doboj Canton in that period. Each patient had to meet the epidemiological, clinical and serological indicators for the diagnosis of this disease. Data were taken from the Cantonal Institute for Public Health of Zenica-Doboj Canton and the Cantonal Hospital in Zenica. We used the data of the Federal Institute of Public Health. Patients were observed in relation to age, gender, place of living, treatment and complications, and treatment outcome. Data were analyzed on a personal computer and statistically analyzed.

4. RESULTS

In the period from January 1, 2008 to December 31, 2012 was treated and reported to the Cantonal Institute for Public Health of Zenica-Doboj Canton 38 infected people, or an average of 7-8 patients per year. Statistical analysis indicate that the distribution of patients according to years does not deviate from the expected distribution ($\chi^2=1.056$; $p=0.901$) (Table 1).

Year	No. of patients	%
2008	7	18.4
2009	5	13.2
2010	7	18.4
2011	10	26.3
2012	9	23.7
Total	38	100

Table 1. Number of patients of meningococcal meningitis in the period from 2008 to 2012

When it comes to territorial distribution of patients by municipalities, the largest number is registered in the municipality of Zenica, 12 patients (31.6%) and Zepce 8 (21.1%). Statistical analysis indicate that there is a significant deviation from the expected uniform distribution of the disease among municipalities ($\chi^2=9.585$; $p=0.0213$) (Figure 1).

The disease occurred throughout the year, but usually in the winter and spring months. Most patients were

Figure 1. Number of cases of meningococcal meningitis by municipalities

registered in February, six patients (15.8%), July 5 patients (13.2%), while in March, October and December by 4 patients (10.5%). Statistical analysis did not indicate significant differences in disease occurrence among months ($\chi^2=1.586$; $p=0.996$) (Figure 2).

Among the patients, there were more males 27 (71.1%) than females 11 (28.9%), which is also a statistically sig-

Figure 2. Monthly distribution of meningococcal meningitis

nificant difference from expected distribution ($\chi^2=4.08$; $p=0.048$) (Figure 3).

Figure 3. Gender structure of the patients

The largest number of patients 21/38 (55.3%) were children aged 0-18 years, and 17/38 (44.7%) patients were older than 18 years (Figure 4). The youngest child was in infancy, and the oldest patients had 67 years. However statistical analysis did not confirm the significant difference from expected distribution by age ($\chi^2=2.106$; $p=0.551$).

Figure 4. Number of cases of meningococcal meningitis by age

When it comes to occupation, most of the patients were preschool children 15/38 (39.5%), followed by pupils 6/38 (15.8%), students 4/38 (10.5%), employed 5/38 (13.2%) and retired 8/38 (21.1%). Statistical analysis reveals significant deviation from expected distribution by occupation ($\chi^2=6.088$; $p=0.039$) (Figure 5).

Figure 5. Occupation of patients suffering from meningococcal meningitis

All patients were treated according to modern standards of intensive treatment applied in case of meningitis (8). From antimicrobial therapies most often were used third-generation cephalosporins (Ceftriaxone and Cefotaxime), or penicillin (15).

The outcome of the disease in most patients was favorable, and the largest number of patients is discharged home as cured or with improved health status.

5. DISCUSSION

Epidemic (meningococcal) meningitis is prevalent throughout the world. By the epidemic spread of the disease comes with the advent of a new, virulent strain of the immune vulnerable population. The occurrence of epidemic meningitis, especially in regions with a temperate climate is a very complex public health problem. Because of its potentially lethal outcome always causes fear and caution, both for primary care physicians, as well as for the infectious disease specialist and pediatricians.

According to the Federal Office of Public Health in the period 2008 to 2012 is registered an increase of patients with epidemic meningitis as compared to the previous period. In this period, a total of 105 patients are registered. The incidence of meningococcal meningitis in the Federation of Bosnia and Herzegovina was 0.7 to 1.6 per 100 000 inhabitants, and is similar to data from the European Union where the incidence ranged from 1.0 to 1.9 per 100 000 for Hungary, Austria, France and Belgium (19,20,21).

In this article we presented a retrospective analysis of epidemiological and clinical characteristics of patients with meningococcal meningitis treated at the Infectious Diseases department of the Cantonal Hospital in Zenica and registered by the Cantonal Public Health Institute of Zenica, in the period from January 1, 2008 to December 31, 2012.

In the period from January 1, 2008 to December 31, 2012 was treated and reported to the Cantonal Institute for Public Health Zenica-Doboj Canton 38 infected people, or an average of 7-8 patients per year. The largest number of cases was registered during 2011- 10 patients (26.3%), 2012-9 patients (23.7%), 2008 and 2010 by 7 patients (18.4%) and 2009 five patients (13.2%)

When it comes to territorial distribution of patients by municipalities, the largest number is registered in the municipality of Zenica, 12 patients (31.6%) and Zepce 8 (21.1%). Then follow Zavidovici 5 patients (13.2%), and high Kakanj with 4 affected (10.5%), 3 Tesanj ill (7.6%),

and Maglaj and Lead with 1 ill (2.6%). In Breza, Doboj South, Usora and Vares patients were not registered.

The disease occurred throughout the year, but usually in the winter and spring months. Most patients were registered in February, six patients (15.8%), July 5 patients (13.2%), as well as in March, October and December by 4 patients (10.5%). In April and May and June were registered by three cases (7.9%), January and August by two patients (5.3%), and September and November by 1 patient (2.6%).

Among the patients, there were more males 27 (71.1%) than females 11 (28.9%). The largest number of patients 21/38 (55.3%) were children aged 0-18 years, and 17/38 (44.7%) patients were older than 18 years. The youngest child was in infancy, and the oldest patients had 67 years.

When it comes to the age structure of patients, the highest number of cases is registered in the age group 0-9 years 15/38 (39.5%), followed by 10-19 years 6/38 (15.8%), 20-29 years 9/38 (23.7%) and 30 and above 8/38 (21.1%), corresponding to the similar reports in the world (1,2,17).

When it comes to occupation, most of the patients were preschool children 15/38 (39.5%), followed by pupils 6/38 (15.8%), students 4/38 (10.5%), employed 5/38 (13.2%) and retired 8/38 (21.1%). All patients were treated according to modern standards of intensive treatment applied in cases of meningitis (8). As antimicrobial therapy usually are used third-generation cephalosporins (Ceftriaxone and Cefotaxime), or penicillin (15). The outcome of the disease in most patients was favorable, and the largest number of patients discharged home as cured or improved. Today in the world there are efforts to reduce the incidence of the disease by vaccination (19,21). Thus, in the last few years register are various vaccines for strains A, C, Y and W135, which showed quite good results in countries where they are applied by significantly reduced incidence of meningococcal serogroup C induced, and serogroup A, Y, W135 meningitis (22, 23).

As the vast majority of isolates from our sample belong to group B, the benefit of today's vaccines in the Federation of Bosnia and Herzegovina and many countries is low. That is why in the world are conducted extensive studies for discovering effective vaccine for this serogroup, and in the future is expected the incidence of the disease will decrease (24, 25, 26). Preventive measures are reduced to chemoprophylaxis (prophylactic use of antibiotics Ceftriaxone, Rifampicin or Ciprofloxacin) in all which are in close contacts-family members, persons which with patient had daily close contact especially in preschool children (daycare) or closed collectives (schools, boarding schools, military barracks), and according to the epidemiologist recommendation.

Also it is important to carry out continuously, and in the case of disease more intense non-specific prevention for all droplet infections such as airing, cleaning and disinfection of the premises, stationery and supplies, personal hygiene and environmental hygiene with special emphasis on the sufficient distance between beds.

6. CONCLUSION

Epidemic meningitis usually causes *N. meningitidis* of serogroup B t in more than half of the cases. Considerably

less frequently it is caused by *N. meningitidis* of group C and even more rarely by groups W135 and Y.

The disease occurs sporadically in the observed period without epidemic. Mainly it is moderately severe to severe clinical disease, while the heaviest form of the disease is fulminant, which usually has a fatal outcome, and was rare in the observed group with 3%. Patients were often infants and small children, or a group of children up to 15 years. For a favorable outcome of meningococcal disease is critical timely recognition and timely initiation of appropriate treatment, even before admission to the intensive care unit, where are applied the most modern standards of treatment of sepsis and septic shock.

Meningitis, which causes the bacterium *Neisseria meningitidis* can be prevented by vaccination (vaccine). For now, there is a quadrivalent vaccine containing serogroups A, C, Y, W135 and it is given to travelers who go to countries where these serogroups causing disease. A vaccine for *Neisseria meningitidis* serogroup B which cause meningococcal disease does not exist in our country. Future of solving this serious and potentially deadly disease will be in preventing or discovering effective vaccines for the most common serogroup B, which will significantly reduce the risk of death in children suffering from meningitis, a disease from which dies dozens of children, and in hundreds of them leaves a permanent disabilities.

CONFLICT OF INTEREST: NONE DECLARED

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