EPIDEMIOLOGY PROFILE OF WEST NILE VIRUS MENINGITIS INFECTIONS IN NORTH-EAST OF ROMANIA

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EPIDEMIOLOGY PROFILE OF WEST NILE VIRUS MENINGITIS INFECTIONS IN NORTH-EAST OF ROMANIA (Abstract): Meningitis is a disease with global presence that represents a worldwide issue, with the West Nile Virus as an etiological factor. The severity of viral meningitis depends on different factors such as age, immune system and etiological agents. \textbf{Aim:} The aim of the study was to study the frequency of West Nile Virus meningitis and to bring a contribution to the existing knowledge of the WNV distribution on adult individuals in Romania. \textbf{Results:} They showed a complete etiological and symptomatic picture for WNV meningitis with the main cause being the climatic changes experienced for the sudden appearance of an increased number of WNV infections. \textbf{Conclusions:} This retrospective study may constitute a foundation for a plan to prevent a possible epidemic of meningitis caused by the West Nile virus. \textbf{Keywords:} EPIDEMIC OF MENINGITIS, WEST NILE VIRUS

Meningitis represents inflammation of the protective membranes covering the brain and spinal cord, associated with abnormal number of cells in the cerebrospinal fluid (1, 2). Aseptic meningitis represents a syndrome characterized by acute onset of meningeal symptoms and fever, with pleocytosis of the cerebrospinal fluid and no growth on routine bacterial culture (1, 3). Viral meningitis can occur at any age but is most common in children (1, 4). In a large study by Rantakallio \textit{et al.} comprising 12,000 subjects, showed the incidence of viral meningitis to be 219 per 100,000 in children under one year of age and 27.8 per 100,000 in children under 14 years old (4). A retrospective study with a small number of subjects showed that the incidence of aseptic meningitis in individuals aged 16 years and over is lower at 7.6 per 100,000 (5). Enteroviruses are said to account for 80\% of cases in adults, but a wider range of causes is increasingly implicated. Often no cause is identified; among 144 consecutive adults with aseptic meningitis, only 72 had a confirmed diagnosis (5,6).

West Nile Virus (WNV) is an arthropod-borne flavivirus which is associated with epidemics of flu-like febrile illness usually associated with occurrence of men-
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However only 1% of the infected people developed a neurological infection, exhibiting a mild illness with a fever-like headache, myalgias, nausea, vomiting and chills (8, 9-13). Around 5 percent of individuals with symptomatic WNV infection develop those neurologic diseases (14). But the percentage of the manifestation of invasive diseases can vary according to many factors such as endemics or season (7).

WNV meningitis presents symptoms such as: rapid onset of headaches, photophobia, back pain, confusion, and continued fever (8). Ordinary diagnostic tests include cerebrospinal fluid (CSF) to differentiate WNV infection from other infections that could give similar symptoms (8). Furthermore, after CSF other analyzes were performed based on this test, to accurately establish that these studied cases were WNV meningitis. Analysis methods such as blood count and PCR from blood and CSF. In addition to having at least one or more of the following symptoms: fever (temperature > 38°C) or hypothermia (temperature < 35°C); cerebrospinal fluid pleocytosis (>5 leukocytes/mm³); peripheral leukocyte count >10,000/mm³; or neuroimaging findings consistent with acute meningaeal inflammation, reinforces the diagnosis of viral meningitis (7).

In this context, in the present paper we were interested in establishing some preliminary epidemiological profile of West Nile Virus meningitis infections in North-West part of Romania.

MATERIAL AND METHODS

We performed a retrospective study, including 29 patients diagnosed with meningitis caused by West Nile Virus, hospitalized during 2017 and 2018 in the “Sf. Parascheva” Clinical Hospital of Infectious Diseases, Iaşi county, Romania.

RESULTS

The study group consisted of 19 males (65.51%) and 10 (34.48%) females, mostly over the age of 61 (58%) and moderate amount of cases being between age of 21 to 40 (22.48%), coming mostly from rural areas (65.51%). The incidence of the studied cases occurred almost exclusively in the months of August (48.38%) and September (40.7%) (fig. 1).

![Fig. 1. Description of gender, origin and age](image-url)
Of these cases, a number of 22 cases were reported with comorbidities such as: diabetes (16.12%), chronic hepatitis (16.12%), neoplasms (16.12%), CKD (9.6%) and cardiac pathology (12.9%) and for the rest there were no comorbidities (48.3%). A large proportion of patients did not use antibiotics (67.74%), but there are subjects who used a series of antibiotics before hospitalization such as: penicillins (16.1%), cephalosporins (9.6%), quinolones (6.45%).

Among the symptoms declared by the patients at admission, the most common was headache (70.96%), followed by confusion (54.83%), fever and other symptoms, with 1 to 7 days declaring the onset of the symptoms before hospitalization. Following the TGP enzyme biochemical analysis, the following values were observed: <40 (48.38%), 41-100 (25.8%), 101-200 (9.6%), 201-300 and >400 they both had the same number of cases (6.45%) and 301-400 with one case (3.2%) and the average value recorded was 99.25.

The blood count analysis of the studied patients showed the following: leukocytosis (67.74%), normal number of leukocytes (32.25%) and no leukocytopenia (fig. 2).

PCR analyzes were also carried out on the cerebrospinal fluid (CSF) from the target group and the following results were obtained: age 0-10 (48.38%) followed by 21-30 (19.35%) a lower value was 11-20 (12.9%) and the values of 31-40 and >40 recorded the same percentage (9.6%). Adults over the age of 40 show the most positive results on PCR analysis, and children younger than 10 years show the fewest positive results.

The number of lumbar punctures was essential for carrying out laboratory analyses, all patients involved in the study had one puncture in order to collect cerebrospinal fluid (CSF).

For 74.19% a second CSF collection was carried out, and for 25.8% a third harvest was necessary, the second and third were necessary because of unfavorable clinical-biological evolution or stationary. After the CSF collection, a CSF appearance test was performed, and the majority of it was clear (83.87%), followed by opalescent (9.6%), and hematic (6.45%).

The analysis of the number of CSF elements showed the highest value for <50 (41.93%), 101-200 (19.35%), value of 201-
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300 (16.12%), for the number of elements 51-100 and 301-400 recorded the same number of 9.6%.

Following the analysis of the albumin value in CSF, the highest value recorded was for 1.1-2 g (52.61%), followed by 0.5-1g (26.39%) and > 2g (21%).

The CSF glucose value analysis showed a hyperglycorrhachia (98%) in the patients involved in the study (fig. 3 a, b).

DISCUSSION

In the present article we traced the exponential increase for WNV meningitis, the study spanned a period of 2 years and presents major symptoms for West Nile Virus meningitis, all cases presented were specifically diagnosed with the West Nile virus. In the case of gender analysis, it can be noted that the occurrence of meningitis caused by WNV is higher in males (65.51%), compared to other viral agents WNV mainly affects adults, an aspect that is previously confirmed by other scientific sources (15). Seasonality is observable during the period of hospitalization of patients, predominantly from July to September. This season is usually characterized by a very hot dry weather, favorable for the proliferation of the viruses responsible for meningitis, which can also be observed in studies in the field (16).

Also recently, our research group become interested on the relationship between the West Nile virus and oxidative stress metabolism, as this was very rarely studied in the past. For example, it was showed that the WNV infection of rabbit PBMCs induces the transcription of HO-1 and inducible NO synthase (iNOS), suggesting that oxidative stress may be involved (17, 18). However, natural WNV strain infections do not induce stress granules (SGs) and some WNV strains could inhibit the SG formation induced by arsenite treatment (19).

The interaction of viral RNA and proteins with TIA-1/TIAR is found to interfere with the formation of SGs (20). Thus, WNV induced both ROS and the antioxidant responses. However, the infected cells do not display characteristics of oxidative stress since the antioxidant responses counteract the negative effects of ROS (19). Thus, it can speculate that the cellular redox status could be quite relevant for the life cycle of WNV.

CONCLUSIONS

In summary, the retrospective study carried out on WNV meningitis presents vital information regarding the spread of this
type of meningitis and the degree of incidence in the north-west area of the country for the period 2017-2018. These results may constitute important data for further development of prophylaxis methods against the spread of WNV meningitis.

**CONFLICT OF INTEREST AND FUNDING**

The authors declare that there is no conflict of interest, and they received no specific funding regarding this scientific research.

**REFERENCES**


