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Clinical Features and Predictors of Lethal Outcome in Tick-Borne Encephalitis: A Retrospective Study from Lithuania

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Summary. *Background.* In Lithuania, the incidence rate of tick-borne encephalitis (TBE) increases and remains the highest in the whole Europe. Diverse clinical manifestations cause difficulties in diagnosing and treating this infectious disease. The aim of the study was to analyze clinical manifestations of the TBE and to indicate predictive variables for unfavorable outcome.

Methods. A retrospective study of case histories of patients diagnosed with TBE and treated at Vilnius University Hospital Santaros Klinikos in the years 2019-2021. Demographic variables, symptoms and clinical form of the disease, laboratory values, and aspects of treatment were recorded.

Results. Six hundred and seven case histories were analyzed. Of these, 588 case histories were included in the final analysis. Men made up 56.97% of the population studied. The median age of the patients was 54 years (18-86). The median length of hospitalization was 9 days (1-50). Seventeen (2.89%) patients were immunized against TBE, the others were not immunized (401, 68.20%) or their immunization status was unknown (170, 28.91%). The most common symptoms were headache (509, 86.56%) followed by febrile fever (403, 68.54%), fatigue (400, 68.03%), and dizziness (394, 67.01%). The most prevalent clinical form of TBE cases was meningoencephalitis (387, 76.18%) followed by meningitis (88, 17.32%), meningoencephalomyelitis (29, 5.71%), and encephalitis (4, 0.79%). Patients with the meningoencephalomyelitic form of TBE less often had headache on admission, more often had diabetes, and had fewer lymphocytes in the CSF (all $p<0.05$). Six patients (1.02%) died. The latter patients were significantly older (71 vs. 53 years, $p=0.003$), had higher protein concentration and cytosis in the CSF (1.04 vs. 0.70 g/L, $p=0.006$ and 422 vs. 84 cells per milliliter, $p=0.003$, respectively), whereas the percentage of lymphocytes in the CSF was lower (62% vs. 81%, $p<0.001$). Univariate analysis showed that older age, absence of headache and fatigue, higher cytosis and percentage of neutrophils in the CSF may be prognostic variables for the lethal outcome of the disease. Multivariate analysis showed that the absence of fatigue and higher pleocytosis were significant predictors of unfavorable outcome.

Conclusions. Clinical forms of TBE differ based on symptoms and laboratory values. Symptoms and laboratory results may prognose the outcome of the disease.

Keywords: tick-borne encephalitis, pleocytosis, meningitis, meningoencephalitis, meningoencephalomyelitis.

INTRODUCTION

According to the World Health Organization (WHO), about 10 000 to 12 000 clinical cases of tick-borne encephalitis (TBE) are reported worldwide each year [1]. In Europe, about 3000 cases of tick-borne encephalitis require

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hospital treatment each year [2]. Furthermore, the incidence of this infectious disease has increased significantly in the last few decades and poses a significant healthcare issue due to the high costs of treatment and follow-up care [3, 4].

Most cases of TBE occur in Central Europe during the peak of the tick activity season [3]. Lithuania is one of the countries with the highest prevalence of tick-borne encephalitis in Europe [5]. For example, data from one study indicate that only two other European countries (Slovenia and Estonia) have more annual cases of TBE than Lithuania [3]. In fact, according to the Health Statistics of Lithuania, 669 cases of TBE were documented in 2020 (incidence of 23.9 cases per 100 000) [6]. Vilnius is the capital of Lithuania and the largest city in the country. Vilnius University Hospital Santaros Klinikos is, respectively, the reference center for adult neuroinfectious diseases in Vilnius district serving a population of 809 000 (27% of the total population in Lithuania).

In addition to the high prevalence of TBE, diverse clinical manifestations are also of great concern, as the disease may vary from asymptomatic infection to a severe meningoencephalomyelitic form [5, 7]. Furthermore, TBE may be a lethal disease [8–10]. Retrospective follow-up studies indicate the mortality rate of tick-borne encephalitis to be 0-1.4% [2]. However, only a few studies have analyzed possible predictive variables for short- or long-term outcome of the disease [11, 12].

THE AIM OF THE STUDY

The aim of the present study is (1) to analyze the clinical characteristics of the most recent obtainable TBE cases in an endemic region of Lithuania and (2) to identify variables that may be predictive of lethal outcome.

MATERIALS AND METHODS

Patients and study design

A retrospective study was performed by analyzing data from the database of the Center of Infectious Diseases and the Center of Neurology of Vilnius University Hospital Santaros Klinikos.

Patients aged 18 years or older diagnosed with tick-borne encephalitis and hospitalized between January 1, 2019 and December 31, 2021 were included in the analysis. The diagnosis was defined based on laboratory results and clinical criteria. The laboratory criteria were the demonstration of specific IgM and IgG activity in serum by immunological tests using enzyme-linked immunosorbent assay (ELISA). Only cases with laboratory-confirmed TBE in serum were included in the analysis. The clinical criteria were the diagnosis of meningitis, meningoencephalitis or encephalomyelitis. Cases of suspected tick-borne encephalitis but not laboratory-confirmed and clinically diagnosed were excluded from further analysis.

Retrospective analysis included patient demographic factors (age, sex), epidemiological and clinical characteristics (immunization status, symptoms, presence or absence of meningeal signs during first neurological examination after admission), CSF sampling results (white blood cell count, % of lymphocytes, protein concentration) and presence or absence of treatment with dexamethasone.

Statistical methods and ethics

Data were analyzed using Microsoft Excel v16 and IBM SPSS v26. Categorical variables were expressed as counts and percentages. Differences between groups for categorical variables were assessed using the ^{2} test or Fisher's exact test. Continuous variables were expressed as the median and minimum-maximum values. Nonparametric tests (Mann-Whitney U or Kruskal-Wallis) were used to identify differences between groups for continuous variables.

Univariate and multivariate logistic regression analysis was performed to assess predictors for lethal outcome. Odds ratios and 95% confidence intervals were used to quantify the strength of these associations. All statistical tests were two-tailed, and P values of less than 0.05 were considered to indicate statistical significance.

The Vilnius Regional Biomedical Research Ethics Committee approved this study. The requirement for informed consent was waived by the Ethics Committee on the basis of the Law on Ethics of Biomedical Research of the Republic of Lithuania (No. 158200-18-984-490).

The confidentiality of the study data was guaranteed. Personal data collected were anonymized and encrypted.

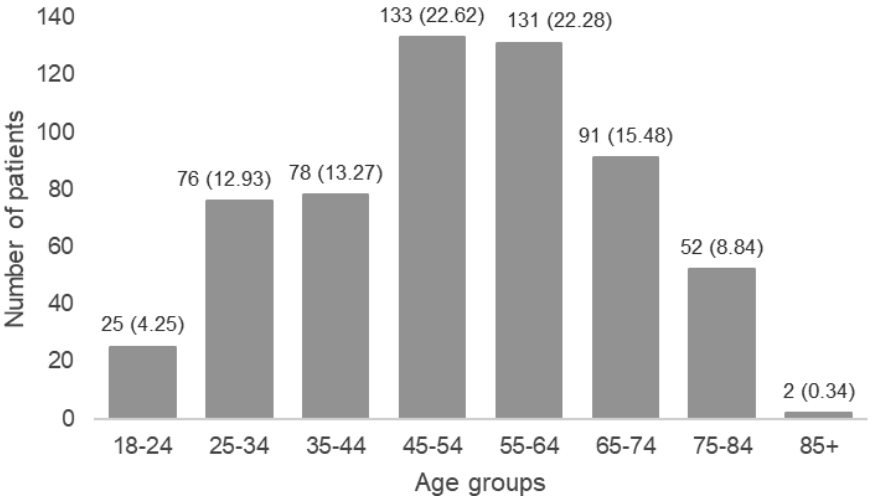

Fig. 1. **Distribution of patients with diagnosed TBE based on age**

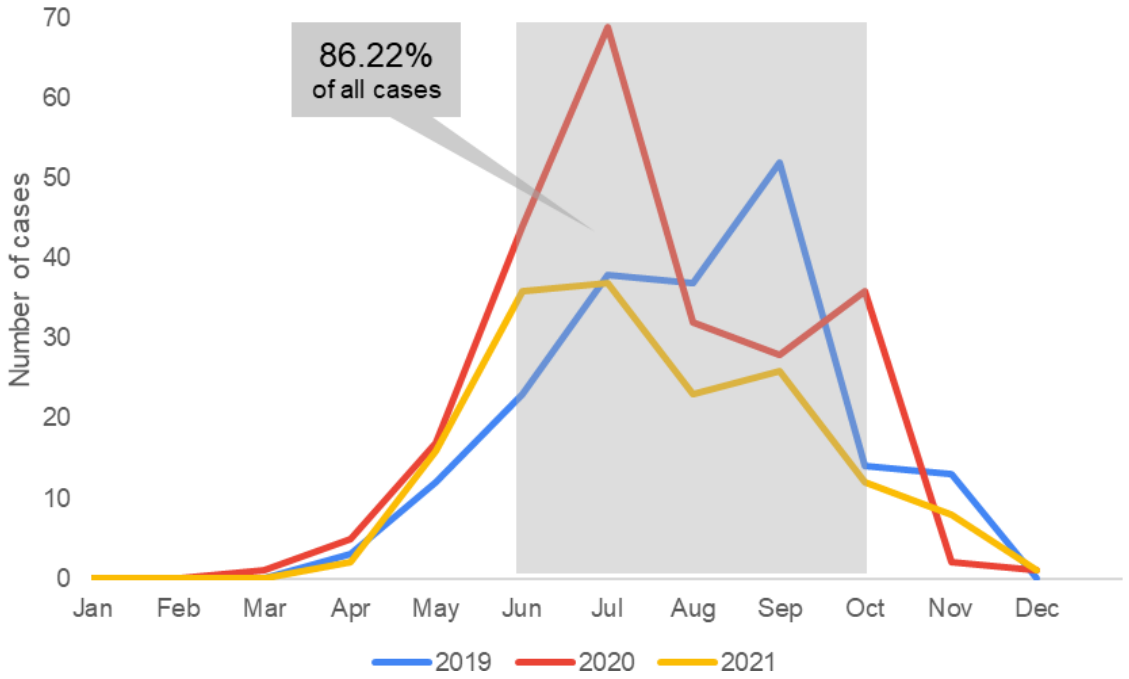

Fig. 2. **Admission rates of patients with TBE based on the time of the year**

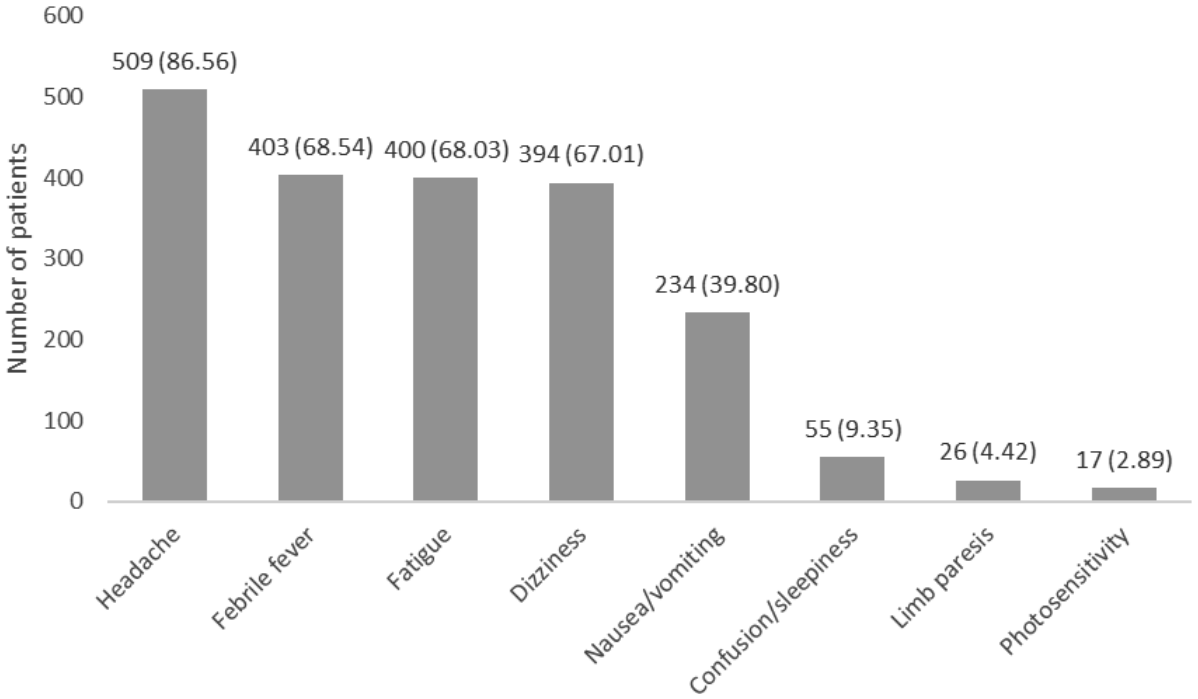

Fig. 3. **Most common symptoms of patients diagnosed with TBE (n=588)**

RESULTS

Of 607 cases of suspected tick-borne encephalitis, 588 (96.87%) were laboratory confirmed and therefore included in further analysis. Of all patients, 335 (56.97%) were men. The median age of the patients was 54 years (18-86); most patients were aged between 45 and 64 years (Fig. 1). Most patients were admitted to hospital during the period June to October (Fig. 2).

Only 17 (2.89%) patients were immunized against TBE; in a quarter of all cases (170 (28.91%)) the immunization status was not documented and 401 (68.20%) patients were not immunized. Patients immunized against TBE less often had fatigue compared to non-immunized patients (p=0.018). Other clinical signs and symptoms did not differ by immunization status (all p>0.05).

The most common symptoms were headache (509, 86.56%) followed by febrile fever (403, 68.54%), fatigue (400, 68.03%), and dizziness (394, 67.01%) (Fig. 3). 206 (35.03%) of the patients did not present with meningeal signs (neck stiffness and/or positive Kernig's sign).

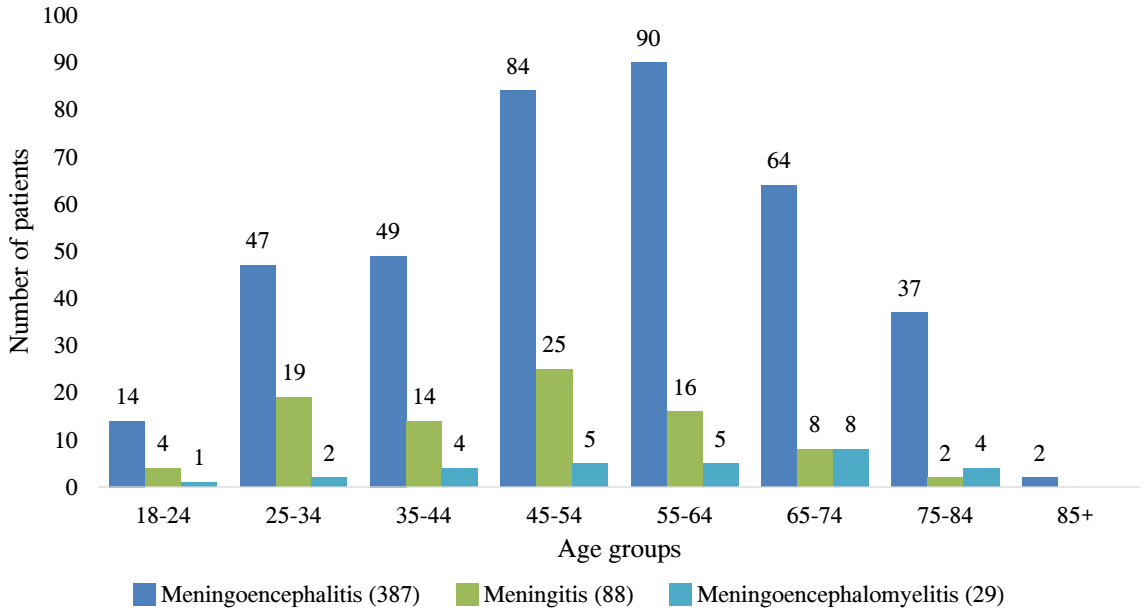

Fig. 4. **Distribution of clinical forms of the TBE based on age**

Clinical forms of the disease were specified in 508 (86.39%) cases. Of these, 88 (17.32%) patients had meningitis, 4 (0.79%) had encephalitis, 387 (76.18%) had meningoencephalitis, and 29 (5.71%) had meningoencephalomyelitis. The meningeal form of TBE was more common among younger patients, whereas the meningoencephalomyelitic form tended to affect older patients (Fig. 4). In addition, patients with the meningoencephalomyelitic form of TBE less often had headache on admission (p=0.004) and more often had diabetes (p=0.002) (Table 1).

Median number of white blood cells (WBC) in cerebrospinal fluid (CSF) was 85 (min. 0 cells, max. 1514 cells). On average, lymphocytes composed 74.3% of WBC in the CSF. Median concentration of protein in the CSF was 0.71 g/L (0.20-67.20). CSF fluid analysis was repeated for 8 (1.36%) patients.

Brain CT/MRI was performed in 307 (52.21%) cases, and EEG in one patient (0.17%). Neither brain CT/MRI nor EEG was performed in 260 (44.22%) patients, while both methods were performed in 20 (3.40%) patients.

Dexamethasone was administered to 361 (61.39%) of patients. These patients had symptoms for fewer days before hospitalization (11 vs. 13 days, p=0.012) and were hospitalized for longer (10.75 vs. 9.69 days, p=0.002). Patients who received adjunctive treatment of dexamethasone also had less lymphocytes in the CSF (78% vs. 87%, p<0.001), less often had primary arterial hypertension (27.1% vs. 36.1%, p=0.021) and heart failure (2.8% vs. 6.2%, p=0.043). The outcome did not differ based on the presence or absence of dexamethasone treatment (1.1% vs. 0.9% of lethal outcome, p=0.79).

Median length of hospitalization was 9 days (1-50). Median time between symptom onset and hospitalization was 11 days (1-45). Almost half (282 (47.96%)) of the patients were first admitted to the department of infectious diseases, 294 (50.00%) to the department of nervous diseases, and 12 (2.04%) directly to the intensive care unit (ICU). Forty (6.8%) patients were treated in the ICU for a median of 5 days (1-24).

Of the documented comorbid diseases, 180 (30.61%) patients had primary arterial hypertension, followed by 29 (4.93%) patients with diabetes mellitus, 24 (4.08%) with heart insufficiency, 20 (3.4%) with oncological disease, 13 (2.21%) with positive anamnesis of cerebrovascular disease (stroke and/or transient ischemic attack),

Table 1. **Comparison of demographic data and symptoms based on clinical form of TBE**

	Meningitis (n=88)	**Meningoencephalitis (n=387)**	**Meningoencephalomyelitis (n=29)**	**p value**
Male sex, n (%)	44 (50)	223 (57.62)	20 (68.97)	0.173
Patient age, Md (min-max)	46 (19-76)	54 (18-86)	59 (23-79)	<0.001
Headache, n (%)	79 (89.8)	338 (87.3)	20 (69.0)	0.012
Febrile fever, n (%)	64 (72.7)	263 (68.0)	21 (72.4)	0.629
Fatigue, n (%)	60 (68.2)	266 (68.7)	21 (72.4)	0.908
Dizziness, n (%)	35 (39.8)	280 (72.4)	20 (69.0)	<0.001
Nausea/vomiting, n (%)	38 (43.2)	154 (39.8)	11 (37.9)	0.814
Confusion/sleepiness, n (%)	5 (5.7)	44 (11.4)	2 (6.9)	0.234

n – number of patients, Md – median.

Table 3. **Relationship between demographic and clinical factors and unfavorable outcome (death) in patients with TBE**

Covariate		Univariate analysis, OR (95% CI), p value	Multivariate analysis, OR (95% CI), p value
Age		1.11 (1.03-1.20), 0.009	1.48 (0.99-2.21), 0.58
Sex, male		0.75 (0.10-5.67), 0.729	n.i.
Clinical characteristics (%)	Headache	0.07 (0.01-0.53), 0.004	0.002 (0-2.08), 0.080
	Fever 38.5 C	0.46 (0.06-3.43), 0.385	n.i.
	Nausea/vomiting	0.75 (0.07-5.31), 0.745	n.i.
	Fatigue	0.09 (0.002-0.83), 0.014	0.01 (0-0.76), 0.038
	Vertigo	0.49 (0.06-3.69), 0.402	n.i.
	Confusion/sleepiness	–	n.i.
	Limb paresis	4.43 (0.09-41.85), 0.239	n.i.
Diabetes mellitus		3.94 (0.08-36.96), 0.263	n.i.
Primary arterial hypertension		4.60 (0.65-51.28), 0.074	n.i.
Protein concentration in the CSF		1.04 (0.94-1.14), 0.492	n.i.
Pleocytosis		1.004 (1.001-1.01), 0.001	1.02 (1.001-1.03), 0.041
% of lymphocytes in the CSF		0.95 (0.92-0.98), 0.001	0.90 (0.80-1.01), 0.083
Documented immunization against TBE		–	n.i.
Administration of glucocorticosteroids		1.26 (0.18-14.04), 0.789	n.i.

OR – odds ratio, CI – confidence interval, n.i. – not included

11 (1.87%) with chronic pulmonary disease, and 7 (1.19%) with chronic kidney disease.

Patients with meningoencephalomyelitis had less lymphocytes in the CSF (62% vs. 81%, p<0.001) and were hospitalized the longest time (18 vs. 9 days, p<0.001). Finally, patients with meningoencephalomyelitic form of TBE had both EEG and radiological examinations performed more frequently (p=0.023). The laboratory and hospitalization characteristics of patients based on the form of TBE are presented in Table 2.

Six patients (1.02%) died. The latter group of patients was significantly older (71 vs. 53 years, p=0.003), had higher protein concentration in the CSF (1.04 vs. 0.70 g/L, p=0.006), higher white blood cell count in the CSF (422 vs. 84 per microL, p=0.003), and lower percentage of lymphocytes in the CSF (62% vs. 81%, p<0.001). Univariate logistic regression showed that older age, absence of headache and fatigue, higher pleocytosis and lower percentage of lymphocytes in the CSF predicted an unfavorable outcome of TBE. After completion of multivariate analysis, absence of fatigue and higher pleocytosis remained statistically significant predictors of unfavorable outcome (Table 3).

Table 2. **Comparison of cases based on clinical form of TBE (n=504)**

	Meningitis (n=88)	Meningoencephalitis (n=387)	Meningoencephalomyelitis (n=29)	p value
Diabetes mellitus, n (%)	2 (2.3)	19 (4.9)	5 (17.2)	0.006
Primary arterial hypertension, n (%)	18 (20.5)	127 (32.8)	11 (37.9)	0.054
Documented immunization against TBE, n (%)	2 (2.3)	11 (2.8)	1 (3.4)	0.179
Protein concentration in the CSF, g/L, Md (min-max)*	0.69 (0.33-1.63)	0.73 (0.20-67.20)	0.74 (0.37-1.25)	0.386
WBC count in the CSF, n/microL, Md (min-max)**	94.5 (1-1205)	80.0 (0-984)	91.0 (9-1514)	0.069
Lymphocyte % in the CSF, Md (min-max)***	85.65 (25.0-100)	80.0 (10.0-100)	62.15 (2.5-93)	<0.001
Administration of glucocorticosteroids, n (%)	40 (45.5)	250 (64.6)	22 (75.9)	0.001
Empyric treatment with antibiotics, n (%)	13 (14.8)	59 (15.2)	9 (31.0)	0.077
Treatment in the ICU, n (%)	0 (0)	22 (5.7)	14 (48.3)	<0.001
Hospitalization in days, Md (min-max)	8 (0-35)	10 (0-49)	18 (3-50)	<0.001

n – number of patients, Md – median.
*86/88 cases in meningitis group, 358/387 cases in meningoencephalitis group, 25/29 cases in meningoencephalomyelitis group.
**84/88 cases in meningitis group, 361/387 cases in meningoencephalitis group, 26/29 cases in meningoencephalomyelitis group.
***87/88 cases in meningitis group, 351/387 cases in meningoencephalitis group, 26/29 cases in meningoencephalomyelitis group.

DISCUSSION

As the expanding tick population causes an increase in new TBE cases in endemic regions, knowing the clinical manifestations and predicting outcomes of the disease is essential [7]. The present study meets such international need by providing data on recent TBE cases treated in one of the highest endemic countries in Europe.

Literature suggests that headache and fever are the sine qua non symptoms of TBE [2, 5, 13]. However, the present study shows that 1 in 10 patients do not have headache at the time of admission and 3 in 10 do not have febrile fever. These findings highlight the importance of a detailed anamnesis in the process of TBE diagnosis, as clinical characteristics may not always be fully compliable. The lack of meningeal signs is another misleading feature of clinical presentation of TBE. Various studies indicate that meningeal signs are not seen in 8.6-39% of patients with TBE [13–15]. Meningeal signs were present in less than 7 in 10 patients, meaning that this aspect has only a supportive role in diagnosing TBE.

Clinical manifestations of TBE range from asymptomatic illness to severe meningoencephalitis with or without paralysis [16]. In the present study, the most frequent clinical form of TBE was meningoencephalitis (76.18%). Meningoencephalitis was also observed as the most frequent clinical form of TBE in other studies from Lithuania (81.3%) and Poland (51.3%) [5, 13]. It is worth mentioning that the subtype of the TBE virus plays an essential role in the manifestation of the disease. The subtype of TBE virus was not identified in the present study; however, it is reasonable to assume that the European subtype of TBE virus was the most prevalent in the current sample, as the latter subtype dominates in the Baltic countries [17]. Compared to the Siberian and Far Eastern subtypes, the European subtype usually manifests with a longer, biphasic, and milder course of illness [17, 18]. Future studies should take such assumptions into account when using results of the present study.

Patients with clinical manifestations of TBE should be hospitalized and, depending on the severity of the disease, referred to the infectious disease department or intensive care unit. A recent German study showed that 12% of patients were treated in the ICU [19]. In our study, 6.8% of the patients needed intensive care, very similar results were obtained in a Slovenian study [3]. Hospitalization in the ICU is associated with the most severe clinical form of TBE – meningoencephalomyelitis. In the present sample, 48.3% of the patients with meningoencephalomyelitis were treated in the ICU. TBE can cause an impairment of consciousness, respiratory failure, central paresis, and seizures. Patients with these clinical conditions need ventilatory support and intensive care [3, 19, 20].

Along with other studies from Lithuania and other countries, the present study highlights a positive correlation between age and more severe clinical forms of TBE [13, 20, 21]. In addition, the most common chronic comorbid illnesses – arterial hypertension and diabetes mellitus – were more common among patients with more severe clinical forms of TBE in the current sample. Although expected, such results again highlight the target groups for primary prevention strategies against TBE. Furthermore, the present study revealed that neutrophil-to-lymphocyte ratio differs depending on the clinical form of TBE. To the best of our knowledge, only one study indicated a relationship between CSF cytosis and clinical form of TBE and none of the studies observed a linkage between a specific ratio of cells in the CSF and clinical forms [20]. The reason for the latter finding is unknown; however, such differences may be at least partially explained by CSF changes due to administration of glucocorticosteroids, as those with more severe form of TBE were treated more frequently.

As there is no etiologic treatment for TBE, patients are treated symptomatically with antipyretics, analgesics, maintenance of fluid and electrolyte balance [7]. In addition, patients with elevated intracranial pressure are often treated with glucocorticoids, such as dexamethasone [13, 21, 22]. Indeed, more than half of the patients in the present sample were treated with dexamethasone. However, the use of corticosteroids as additional therapy to improve the outcomes of patients with TBE has not been proven by controlled studies [3, 21]. One study from Lithuania even observed a positive relationship between corticosteroid administration and longer hospitalization; however, it is difficult to assess the role of the latter treatment in the outcome of TBE as most patients with severe disease received corticosteroids [21]. In contrast, another study found that administration of corticosteroids for less than 10 days did not affect the duration of hospitalization [13].

Radiological examination (head CT/MRI and/or EEG) was performed in more than half of the patients in the present sample. As it is known, radiological examination should not be used for diagnosing TBE due to lack of specificity and sensitivity [19, 23, 24]; in most cases, imaging of the brain and spinal cord were used for exclusion of brain oedema and differential diagnosis.

In the present study, the case fatality rate of TBE was 1.02%. This is similar to the rate found in another study from Lithuania (0.7%) [5]. As with clinical forms of TBE, the lethality of the disease is affected by the subtype of the virus. For example, mortality rate of TBE caused by the European TBEV subtype is 0.5-5%, whereas the Far Eastern TBEV subtype has the highest mortality rate (20-40%) [25–27]. Further, multivariate analysis showed that the absence of fatigue predicted lethal outcome of the disease. This finding should be interpreted with caution: in more severe cases of TBE, fatigue may simply not be documented in the medical records, since more severe symptoms (i.e., confusion, sleepiness, etc.) are clinically more significant. Higher pleocytosis seems to be more relevant and reliable predictive variable, as other studies confirm such a relationship between cytosis in the CSF and the outcome [5, 19, 20].

LIMITATIONS

Our study has several limitations to mention. First, our study was limited to one tertiary center hospital, thus, the patients may not accurately represent the whole population of TBE cases in Lithuania. In addition, Vilnius University Hospital Santaros Klinikos had to make structural changes to meet the needs of patients during the COVID-19 pandemic. Due to this reason, patients with TBE were hospitalized both in the Infectious Diseases Center and in the Center of Neurology. This aspect may have influenced the interpretation of the medical records, as they slightly differ between these two centers. In addition, due to subtle and unique medical records, we were not always able to trace the exact time of onset of symptoms in the first wave. In a significant number of medical records, the date of first symptoms (i.e., first wave symptoms) was unclear or imprecise. Thus, we decided to include only the period between the onset of second wave symptoms and hospitalization. Finally, only six lethal outcomes were recorded in the cases examined. Therefore, the calculation of predictive variables for lethal outcome may lack statistical power.

CONCLUSIONS

Despite the existence of vaccines, tick-borne encephalitis remains a common neuroinfectious disease with high hospitalization rates in Lithuania. Our study describes a variety of clinical manifestations of tick-borne encephalitis. Predictive variables of lethal outcome were proposed and discussed.

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ERKINIO ENCEFALITO KLINIKINĖ IŠRAIŠKA IR BLOGOS PROGNOZĖS VEIKSNIAI: RETROSPEKTYVUS TYRIMAS

Santrauka

Įvadas. Lietuvoje sergamumas erkiniu encefalitu (EE) nuolat auga ir išlieka didžiausias visoje Europoje. Įvairialypis ligos klinikinis pasireiškimas kelia sunkumų diagnozuojant ir gydant šią infekcinę ligą. Tyrimo tikslas – apžvelgti EE klinikinį pasireiškimą ir nurodyti prognostinius nepalankios ligos baigties veiksnius.

Tiriamieji ir tyrimo metodai. Atlikta retrospektyvi pacientų, kuriems buvo diagnozuotas erkinis encefalitas ir kurie buvo gydomi Vilniaus universiteto ligoninės Santaros klinikose 2019–2021 m., ligos istorijų analizė. Vertinta: demografiniai rodikliai, ligos simptomatika, klinikinė forma, laboratoriniai rodikliai, gydymo aspektai.

Rezultatai. Išanalizuotos 607 pacientų ligos istorijos. Į galutinę analizę įtrauktos 588 pacientų ligos istorijos. Vyrai sudarė 56,97 % visų pacientų. Amžiaus mediana – 54 metai (18–86). Vidutinė hospitalizavimo trukmė buvo 9 dienos (1–50). Septyniolika pacientų (2,89 %) buvo paskiepyti nuo EE, kiti pacientai neskiepyti (401, 68,20 %) arba jų imunizacijos statusas nežinomas (170, 28,91 %). Dažniausi pacientų simptomai buvo galvos skausmas (509, 86,56 %), karščiavimas (403, 68,54 %), bendras nuovargis (400, 68,03 %) ir galvos svaigimas (394, 67,01 %). Dažniausia klinikinė EE forma buvo meningoencefalitas (387, 76,18 %), mažesnę dalį atvejų sudarė meningitas (88, 17,32 %), meningoencefalomielitas (29, 5,71 %) ir encefalitas (4, 0,79 %). Pacientai, sergantys meningoencefalomielitine EE forma, rečiau skundėsi galvos skausmu, dažniau sirgo cukriniu diabetu, jų likvore registruota didesnė neutrofilų procentinė dalis (visi $p < 0,05$). Šeši pacientai (1,02 %) mirė. Pastarieji pacientai buvo vyresni (71 vs. 53 m., $p = 0,003$), jų likvore baltymų koncentracija ir citozė buvo didesnės (atitinkamai 1,04 vs. 0,70 g/l, $p = 0,01$ ir 422 vs. 84 ląstelių/ml, $p = 0,003$), o limfocitų santykinė dalis – mažesnė (62 % prieš 81 %, $p < 0,001$). Vienmatė regresinė analizė parodė, kad vyresnis amžius, galvos skausmo ir bendro silpnumo nebuvimas, didesnė likvoro citozė ir neutrofilų procentinė dalis gali būti prognostiniai letalios EE ligos išeities veiksniai. Daugiamatė analizė parodė, kad nuovargio nebuvimas ir didesnė pleocitozė yra reikšmingi nepalankios baigties prognostiniai veiksniai.

Išvados. Klinikinės erkinio encefalito formos pasižymi skirtinga simptomatika ir laboratorinių tyrimų rodikliais. Erkinio encefalito simptomatika ir laboratorinių tyrimų rodikliai gali padėti prognozuoti ligos baigtį.

Raktažodžiai: erkinis encefalitas, pleocitozė, meningitas, meningoencefalitas, meningoencefalomielitas.

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