TRICHINELLOSIS IN HUMANS IN PAZARDZHIK PROVINCE (1990-2024)

Dimitar Vuchev,
Galya Popova-Daskalova

Department of Infectious Diseases, Parasitology and Tropical Medicine, Medical University of Plovdiv

ABSTRACT

Background. Trichinellosis is a parasitic disease acquired by ingestion of raw or undercooked meat infected with *Trichinella* larvae. The incidence of trichinellosis has decreased in the country for the last fifteen years. The aim of the study was to analyze the dynamics of trichinellosis in humans in Pazardzhik Province (in the south-central Bulgaria) for the period 1990-2024.

Material and methods. Data for this retrospective cross-sectional study were obtained from epidemiological studies and annual reports of the Laboratory of Medical Parasitology at Regional Health Inspectorate – Pazardzhik, as well as personal observations of patients with trichinellosis.

Results. A total of 472 infected persons and 16 outbreaks were registered in the province for the studied 34-year period. Most of the outbreaks were registered between 1990 and 2000, the last one occured in 2024. The source of infection was pork, wild boar meat or it was unknown but trichinoscopy of the meat was not done before consumption. Most affected were adults – 391 cases (82,8%) and city residents – 307 cases (65%). One hundred twenty-five (38%) patients had anti-*Trichinella* IgG when they were diagnosed with trichinellosis.

Conclusions. Trichinellosis remains a parasitic disease of medical importance for Pazardzhik Province. Awareness about the disease should be raised among doctors, population, especially in potentially endemic villages with registered outbreaks, pig farmers and hunters. When a case of trichinellosis is diagnosed, a detailed history can detect the source of infection. Meat inspection plays a significant role in preventing trichinellosis.

Key words: trichinellosis, incidence, epidemiology, prevention

ADDRESS FOR CORRESPONDENCE:
Galya Popova-Daskalova, PhD
Department of Infectious Diseases, Parasitology and Tropical Medicine, Medical University of Plovdiv
Vassil Aprilov 15A, 4002 Plovdiv, Bulgaria
e-mail: galiya.popova@mu-plovdiv.bg
phone: +359 896212889

BACKGROUND

Trichinellosis is a zoonosis with worldwide distribution, more common in temperate climate regions. It is caused by nematodes of the genus *Trichinella*. There are nine species and four genotypes in this genus but the most common causative agent in humans is *Trichinella spiralis*. A lot of carnivores and omnivores are hosts of *Trichinella* spp. Humans acquire it by ingestion of raw or undercooked meat from pigs or other animals infected with *Trichinella* larvae (1-5).

Mandatory inspection of pork has been introduced in the country since 1910 (6). In the past, trichinellosis was a rarely diagnosed parasitic disease in Bulgaria but nowadays Bulgaria is among the most affected European countries . For the period 2019-2023, the EU notification rate was 0.01-0.03 per 100 000, in comparison to 0.79-0.02 per 100 000 in our country (7). Since 2010, a decreasing trend in morbidity has been observed, but it varies across different regions (8-11). In the 90s, Pazardzhik Province (located in the south-central Bulgaria) was one of the most affected by trichinellosis. Cases of the disease in the province were also observed in the past. In 1934, Vasil Mollov reported two trichinellosis outbreaks - in the cities of Panagyurishte and Strelcha. In 1973, 2 cases were registered in one family (12,13).

Aim. The aim of the study was to analyze the dynamics of trichinellosis in humans in Pazardzhik Province for the period 1990-2024.

Material and methods. Data used for this retrospective cross-sectional study of the prevalence of trichinellosis among the population of Pazardzhik Province, covering a 34-year period, were obtained from epidemiological studies and annual reports of the Laboratory of Medical Parasitology at the Regional Health Inspectorate – Pazardzhik as well as from personal observations of patients diagnosed and treated for trichinellosis from January 1990 to December 2024. The criteria used to classify the forms of trich-

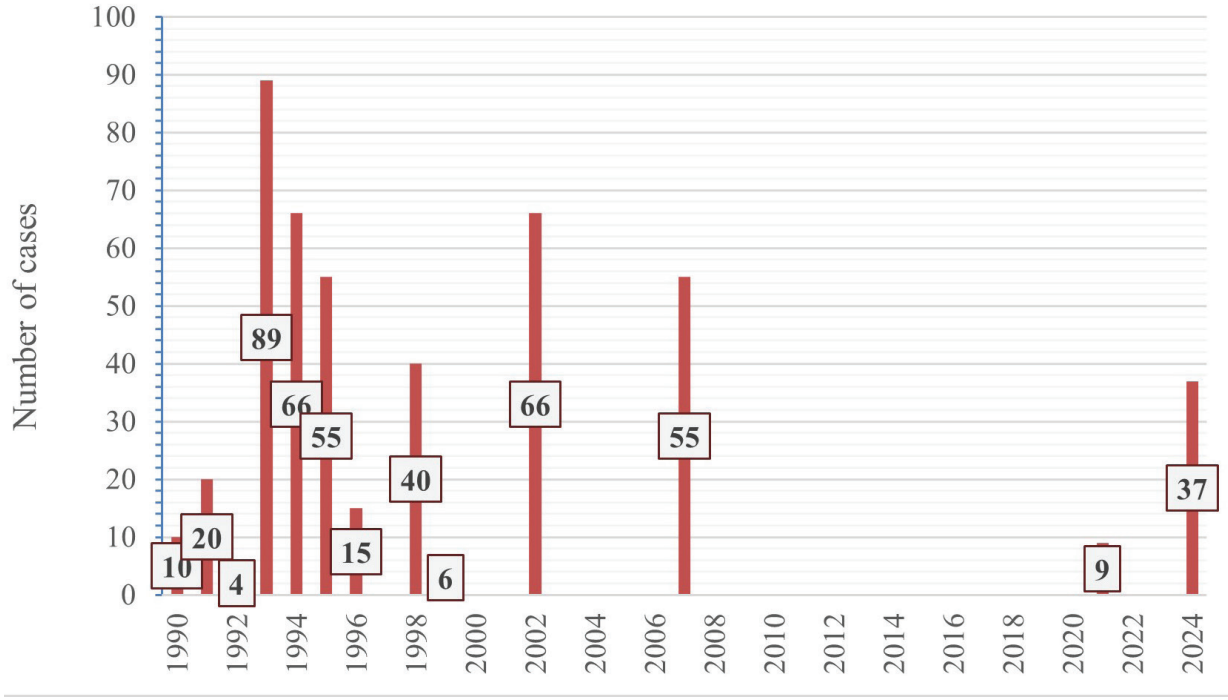

Fig. 1. Cases of trichinellosis in Pazardzhik Province (1990-2024)

inellosis were as follows: asymptomatic form – with a history of exposure to contaminated meat but without clinical signs and symptoms; abortive form – transient signs and symptoms, lasting for a few days; mild – mild signs and symptoms, without complications; moderate – presence of full blown syndrome, with rare benign and transient complications ; severe –pronounced signs and symptoms, with circulatory and/or neurological complications (14,15). Statistical analysis (t-test, mean, SD) was done using SPSS v.19.

Results. A total of 472 cases of trichinellosis and 16 outbreaks were registered in Pazardzhik Province for the period 1990-2024. All of them were observed from November to April. From 1990 to 2000, outbreaks were registered annually. The highest number of cases was in 1993: a total of 89 people were infected in two outbreaks. Two outbreaks were also registered in 1994 (a total of 66 patients) and 1995 (55 patients). Several cases in one family were registered twice - in 1992 (4 patients) and 1999 (6 patients). From 2000 to 2024, a decreasing trend in the number of trichinellosis outbreaks was observed, with only 4 outbreaks registered. The last one with 37 infected persons occurred in 2024 (Fig. 1):

The infected people were 4-75 years old (mean±SD 44,3±15,2). The age distribution showed that adults (above 19 years of age) were mainly affected (82,8% or 391 persons), while children and adolescents (under the age of 19) comprised only 17,2% (81 persons), ($p<0.01$). The highest number of patients were in the age group 40 - 49 (54 or13,8%). Females comprised were 52,3% of the patients (247 persons) vs. 47,3% males (225 persons) ($p>0.05$). During the study period, trichinellosis was diagnosed more frequently in city residents (307 cases , 65%) while village residents were 169 (35%) ($p<0.01$).

A total of 333 patients (70,5%) were tested for anti-*Trichinella* IgG , based on signs or symptoms of the disease or a history of consumption of contaminated meat. Reverse passive haemagglutination was used in 245 of the cases. It showed that 85 (35%) of the tested persons were positive. ELISA test was used in 88 of the cases, 40 (45%) of them were positive for antibodies. Regardless of the method, 125 (38%) of the tested had positive serology for trichinellosis.

Different forms of the disease were observed during the studied period. Abortive forms occurred in 146 (31%) of the patients, mild forms – in 151 patients (32%), moderate – in 175 (37%) of the patients. Few complications (in 1,5% of the infected) were registered, including single cases of myocarditis, pneumonia, and anemia and 4 cases of radiculoneuritis, but no fatal cases.

Patients diagnosed with trichinellosis between 1990 and 2000 were treated with mebendazole 20 mg/kg for 10-14 days. After this period, patients received albendazole 10-15 mg/kg for 7-14 days. Another 14 persons who consumed infected pork in 2011, took

chemoprophylaxis with albendazole for 3 days from the day following the consumption. As a result, none of these persons developed clinical features of trichinellosis later.

We found that half of the outbreaks were caused by wild boar meat (Tabl. 1):

Tabl. 1. Source of infection of trichinellosis outbreaks in Pazardzhik Province (1990-2024)

Source of infection	Number of outbreaks/%	Infected persons/%
wild boar	8 (50%)	312 (66,1%)
domestic pork	7 (44%)	150 (31,8%)
unknown	1 (6%)	10 (2,1%)
Total	**16** (100%)	**472** (100%)

The infected meat was consumed as raw fillets and sausages made of domestic pork or wild boar meat. In none of the cases trichinoscopy of the meat had been done before consumption but trichinoscopy and artificial digestion of the infected meat, which caused the last two outbreaks were conducted in the Regional Health Inspectorate - Pazardzhik. They revealed that the consumed sausages contained larvae of *Trichinella* spp. *Trichinella* larvae collected from the contaminated meat (meat product) were then subjected to species identification by polymerase chain reaction, conducted at the National Centre of Infectious and Parasitic Diseases. *Trichinella britovi* was the species identified in both cases and the source of infection was wild boar meat. In one of these cases, the wild boar was shot illegally, and in the other case, the meat was purchased from uncertain source.

Outbreaks were observed in several settlements, as shown in Fig.2 (Fig. 2):

Outbreaks occurred mainly in the northern part of the province (the southern foothills of Sredna Gora mountain) as follows: in Panagyurishte, Levski, Banya, Strelcha, Popintsi and Borimechkovo. In the middle part of the province (the Upper Thracian lowland) trichinellosis cases were registered in Pazardzhik, Septemvri, Aleko Konstantinovo, Belovo, Sestrimo. Cases were also registered in two villages in Rhodopa mountain - Byaga and Ravnogor.

DISCUSSION

Trichinellosis is a food-borne parasitic disease. It occurs as sporadic cases or outbreaks, affecting family members, relatives, and friends, mainly in autumn and winter during the hunting season or when the domestic pigs are slaughtered (6).

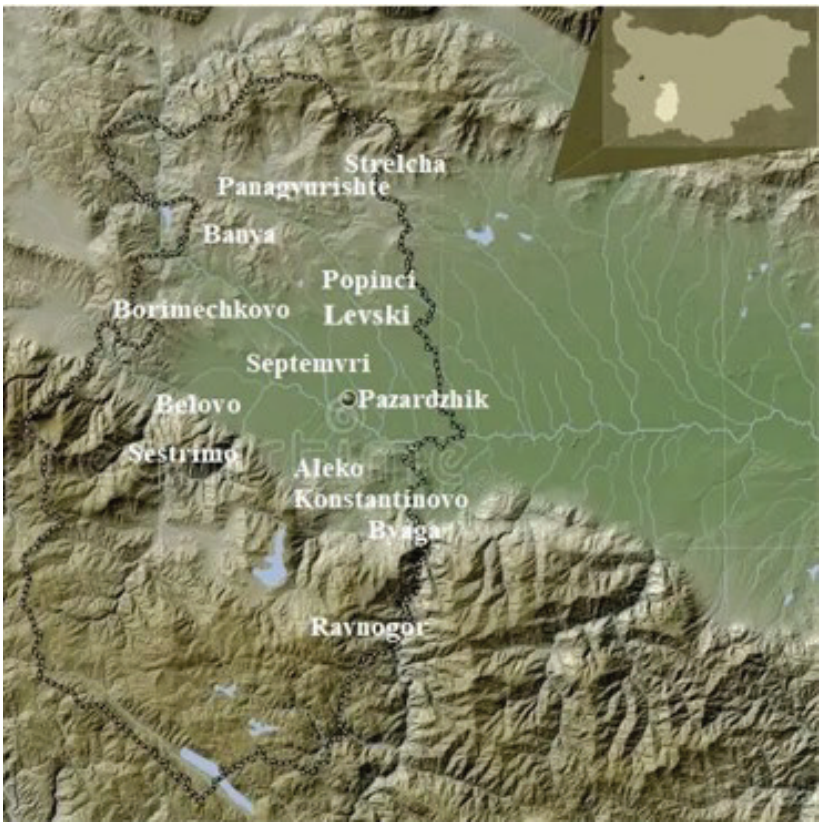

Fig. 2. Settlements with cases of trichinellosis in Pazardzhik Province (1990-2024)

Pazardzhik Province has some geographical, social, and economic characteristics which favor the spread of trichinellosis. Out of 4,458 km^2, most of the half (58%) of the province is occupied by mountains and forests. In its southern and southwestern part are the Western Rhodopes and the Rila mountain. Agricultural areas occupy 36% of the territory and have favorable soil and climatic conditions. These factors are suitable for the survival of hosts of *Trichinella* spp.: boar, fox, jackal, wolf, bear, wild cat, squirrel, goldfinch, badger. In addition, pig farming is well developed: about 50,000 pigs are raised in private farms (12,13). Outbreaks were observed among the population of mountainous areas and lowland villages of the province. In some villages more than one outbreak have been registered. The number of outbreaks has decreased in Pazardzhik province since 2000. A similar situation has been observed throughout the country for the last 15 years. It can be explained with stricter veterinary control of pig farming and meat obtained through hunting, as well as the population awareness of the disease (9).

Identifying the source of infection is of essential epidemiological and clinical importance. In our study wild boar meat was the main source of infection. According to data from Raynova (2020), in Bulgaria from 2000 to 2017, the main source of infection was also wild boar meat (in 45% of the outbreaks) (9). In Europe, wild boar meat has been a major source of trichinellosis in humans for the last ten years whereas earlier, pig meat was the main source (7, 16,17).

The most common *Trichinella* species in Bulgaria as well as in the Balkan region are *T. spiralis* and *T. britovi* (9,18,20). Species of *Trichinella* was determined only in the last two outbreaks, so we could not discuss the severity of the disease caused by different species. There are data that *T. spiralis* is responsible for more severe clinical pictures compared to *T. britovi* (9,21).

Trichinellosis affects primarily adults (3). This is explained by the fact that children are not given undercooked pork, home-made sausages or game meat (17,22). In the present study, slightly more cases were registered in women, without statistical significance. Our data differ from the data for the country, which show that men are more commonly affected (9).

Trichinellosis affected predominantly city residents. The reason is probably the intensive migration of the population from villages to cities over the last three decades. Moreover, home-made sausages are given to relatives and friends living in urban regions (17,22). Medical doctors faced some difficulties in the diagnosis of trichinellosis as signs and symptoms are not specific (6,23). History of consumption of raw or underdone meat is essential for the accurate diagnosis. Serology is widely used for diagnosis, and ELISA is the most common serological test. Initially, patients may have negative serological results because production of specific antibodies takes 3-4 weeks (14,24). In our study around 40% of the tested had anti-*Trichinella* antibodies at the time of diagnosis. A higher percentage of patients diagnosed with trichinellosis with anti-*Trichinella* antibodies was reported by Vutova et al. (79.4% of those tested with reverse passive haemaglutination and 75.9% with ELISA) (2020) (23). This difference in the results can be explained by the different sensitivity of serological tests, the time of infestation and the immune status of the infected (14,24).

When treatment with anthelmintics (albendazole or mebendazole) is initiated early during the enteral phase or acute stage, its effectiveness is greater (14,15). Probably, because of accurate etiological therapy we observed a low percentage of complications, and no fatal cases. Chemoprophylaxis with albendazole is most effective when it starts early, if possible, within 6 days following consumption of contaminated meat (25). We observed this effect in people taking albendazole the day after the consumption.

Conclusions. Although cases of trichinellosis in humans have decreased in Pazardzhik Province, it remains a parasitic disease of medical importance. Awareness about the disease should be raised among doctors, population, especially in potentially endemic villages with registered outbreaks, among pig farmers and hunters. Meat inspection plays a significant role in preventiing trichinellosis. When a case of trichinellosis is diagnosed, a detailed history can detect the source of infection. Screening of other people who have consumed the same meat products contributes to the timely diagnosis and treatment of all infected persons.

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Conflict of interests. None of the authors have conflicts of interest to disclose.

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