

Epidemiological data on lymphoglandular toxoplasmosis in immunocompetent adults in Albania

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Abstract

Aim: Toxoplasmosis is a worldwide infectious disease, caused by a parasite most often found in cats and farm animals. Humans can get this disease from contacts with feces of infectious cats, eating raw or undercooked meat and contaminated vegetables or being born with it. Once a person is infected, the infection remains in the body for life. The aim of this study was to highlight selected epidemiological aspects of Lymphoglandular Toxoplasmosis in immunocompetent adults in Albania.

Methods: 291 patients admitted at the University Hospital Center “Mother Teresa” in Tirana over the years 1984-2012 and diagnosed with Lymphoglandular Toxoplasmosis were included in this study (age range: 15 to 60 years). Socio-demographic data included sex, age group, place of residence (urban or rural area), educational level and profession. In addition, clinical information was collected including month of onset of illness, behavioral data characteristics such as contacts with cats, meat consumption and the quality of water consumed.

Results: Male-female ratio was 1:1.8. The ages affected most included individuals 26-55 years old. Regarding the educational level, 17.2% of individuals had completed university studies, 32.3% the high school and the remaining 50.5% of participants had completed only the elementary school. Toxoplasmosis was present in 18 regions of the country, whereas contacts with cats were reported in 40.9% of the cases.

Conclusions: Toxoplasmosis is a widespread disease in Albania and Lymphoglandular Toxoplasmosis in immunocompetent adults is present as well. Incidence and prevalence of this disease is cross-linked with age, education level, season, personal hygiene, contact with cats and way of feeding. Education of the general population and continuous education of health professionals are important means for an effective control and prevention of this disease.

Keywords: cats, epidemiological data, food hygiene, prevention, *Toxoplasma Gondii*.

Introduction

Toxoplasmosis is an infectious disease caused by *Toxoplasma Gondii*, an obligatory intracellular parasite of all warm-blooded hosts worldwide, part of Coccidian family, which is considered as the most prevalent parasitic infection to humans and domestic animals in the world (1). This parasite has infected almost one third of the world's population (2). The ingestion of water contaminated with oocysts from the feces of infected cats and/or eating unwashed raw vegetables, fruits or consumption of tissue cysts in undercooked meat, such as pork or lamb are identified as an important risk factor in most epidemiological studies (3). Once a person is infected, the infection remains in the body for life, usually in an inactive form. It can reactivate when that person's immune system is weak, while congenital toxoplasmosis is a major problem of public health. Toxoplasmosis in an otherwise healthy person may present no symptoms or only a few swollen glands usually in the patient's neck, whereas in persons with a weakened immune system may only have symptoms of swollen glands, or in the case of an infection that attacks the brain and the nervous system the symptoms may include fever, seizures, headache, psychosis, and problems with vision, speech, movement, or thinking.

Felids are definitive host for *T. Gondii*. All hosts, including humans, can be infected by one of the three forms of the parasite *Toxoplasma Gondii* that correspond to the three morphological stages: tachyzoite, bradyzoite and sporozoite form. Environmental conditions are important for oocyst survival. The infection can cause serious health problems in people with compromised immune system.

Methods

Our experience in Tirana regarding lymphoglandular toxoplasmosis of immunity deficiency patients is quite good, but a study focused in lymphoglandular toxoplasmosis in competent immunity persons is missing. This was the reason for this cross-sectional study, conducted at Department of Infectious Diseases at the University Hospital Center "Mother

Teresa", over the years 1984-2012, which included a representative sample of 291 patients aged 15 to 60 years (186 women and 105 men).

The data collection tool comprised a structured questionnaire. Data on socio-demographic and socioeconomic factors, as well as information about their lifestyle factors (relation with cats, feeding behavior regarding fruit, vegetables, meat, water consumption, rural or urban residences area, season or month of disease onset) were collected through a standard form, clinical file or via face-to-face interviews. Education level was recorded into a three category variable, elementary school, high school and patients with a university degree. We tried to find out the relation between level of education, hygiene and incidence of this disease and the findings were very interesting. Age-group was categorized into six categories: 15-25 years, 26-35 years, 36-45 years, 46-55 years, 56-65 years and >65 years old. The respondents' self-reported information about their social and employment status were recorded too. Environmental conditions in respect to global warming and consequents in the transmission of the infection were also in the focus of our study. We tried to assess a possible correlation between the incidence and prevalence of lymphoglandular toxoplasmosis and the population (number of inhabitants) of different cities in Albania, as well as movement of the people from rural to urban districts.

Chi-square test was used to compare differences in lymphoglandular toxoplasmosis prevalence levels between different socio-demographic and socio-economic groups of study participants. Statistical Package for Social Sciences (SPSS), version 16.0, was used for all the statistical analyses.

Results

Male comprised 36% of the cases compared to 64% of the females. Hence, the male-female ratio was 1:1.77. Regarding the distribution by age-group: 55 (18.90%) of individuals were 15-25 years, 62 (21.30%) were 26-35 years, 78 (17.52%) were 36-45 years, 57 (19.58%) were 46-55 years, 34

(11.68%) were 56-65 years and only 5 (1.71%) patients were >65 years.

Statistical analysis by use of the chi-square test did not show any significant changes regarding the age-group and sex of participants (both $P>0.05$).

Our patients displayed different levels of educational attainment: 50 of them or 17.18% graduated at university; 94 of them or 32.30% had high school graduation; and 147 cases or 50.51% had attended only the elementary school (Table 1).

Table 1. Distribution of patients by age, sex and level of education

Age and level of education		Sex (No. of cases and %)		Total
		Female	Male	
Age	15-25 years	35/18.81%	20/19.04%	55/18.90%
	26-35 years	38/20.43%	24/22.85%	62/21.30%
	36-45 years	53/28.49%	25/23.80%	78/26.80%
	46-55 years	35/18.81%	22/ 20.95%	57/19.58%
	56-65 years	22/1.82%	12/11.42%	34/11.68%
	>65 years	3/1.61%	2/1.90%	5/1.71%
Total		186	105	291
Level of education	Elementary school	92/49.46%	55/52.38%	147/50.51%
	High school	63/33.87%	31/29.52%	94/32.30%
	University	31/16.66%	19/18.09%	50/17.18%
	Total	186	105	291

Regarding the geographical distribution, patients were pertinent to all regions of Albania, with a slight predominance of the Western region and urban areas (Table 2). More than half (51.54%) of toxoplasmosis cases were located in urban

areas. The overwhelming majority of toxoplasmosis cases were located in the Western region (88.65%), followed by South-East region (4.12%), South (3.78%) and North-North East region (3.43%) [data not shown in the tables].

Table 2. Geographical distribution of all the clinical cases

Variable		Number of cases	Percentage
Region	District		
Western	Tirana	60	20.62
	Durrësi	11	3.78
	Kavaja	5	1.72
	Elbasani	10	3.44
	Lushnja	41	14.09
	Fieri	53	18.21
	Berati	36	12.37
	Vlora	19	6.53
	Lezha	7	2.41
	Laci	3	1.03
North-North East	Shkodra	13	4.47
	Kukesi	3	1.03
	Dibra	4	1.37
South-East	Tropoja	3	1.03
	Librazhdi	7	2.41
South	Korca	5	1.72
	Saranda	5	1.72
Total	Gjirokastra	6	2.06
		291	100

Statistical analysis showed significant changes in morbidity levels between Tirana residents and other regions of Albania (OR=1.32, P=0.023). Thus, Tirana residents were infected 1.32 times more from toxoplasmosis than residents from the other regions.

We observed a statistically significant difference between urban and rural residents (P<0.05).

According to the type of profession, our cases were dominated by farmers, followed by unemployed people and pupils (Table 3).

Table 3. Toxoplasma Gondii cases by profession

Variable	Number of cases	Percentage
Profession		
Pupils	36	12.37
Student	16	5.50
Teacher	5	1.72
Nurse	4	1.37
Engineer	7	2.41
Economist	10	3.44
Lawyer	2	0.69
Artist	5	1.72
Shop assistant	16	5.50
Hairdresser	7	2.41
Cowman	47	16.15
Farmer	69	23.71
Construction worker	18	6.19
Unemployed	49	16.84
Total	291	100

We also studied the distribution of our patients by seasonality and months. Results are presented in Table 4. There was a significant difference between

the number of infected cases in spring and summer seasons (P<0.05). The number of cases in “warm” seasons was higher.

Table 4. Toxoplasma Gondii cases by seasonality and months of the year

Variable		Number of cases	Percentage
Season	Month		
Spring	March	39	13.40
	April	27	9.28
	May	31	10.65
Summer	June	32	11.00
	July	36	12.37
	August	31	10.65
Autumn	September	31	10.65
	October	23	7.90
	November	14	4.81
Winter	December	8	2.75
	January	10	3.44
	February	9	3.09
Total		291	100

Felids are definitive hosts for *Toxoplasma Gondii*. It can be noted that 119 cases (62.97% of cases for whom information was available) did have contacts with cats and the remaining 70 cases (around 37.03%) did not have such contacts (Table

5). Undercooked meat consumption remains the major risk factor for *Toxoplasma* infection. Waterborne transmission of *Toxoplasma Gondii* is also common (Table 5).

Table 5. Distribution of toxoplasma Gondii cases by source of infection

Variable	Number of cases*	Percentage
Kinds of consumed meat		
Calf	60	31.75
Pig	17	8.99
Lamb	28	14.81
Chicken	69	36.51
Fish and scallops	15	7.94
Total	189	100
Kind of consumed water		
Tap water	66	34.92
Well water	52	27.51
Spring water	37	19.58
Bottled water	34	17.99
Total	189	100
Contact with cats		
Yes	119	62.97
No	70	37.03
Total	189	100

* Information was missing for 102 cases.

Discussion

The material presented above evaluates the epidemiological data of Lymphoglandular Toxoplasmosis in Albania. Regarding the gender, women were more affected (63.91%), as well as people living in rural areas due to gardening, lifestyle, hygienic level and contacts with domestic animals. This clinical fact is also observed in the international literature (1,4). In terms of age, we noticed that lymphoglandular toxoplasmosis is often observed in ages up to 26-55 years (with 197, or 67.69% of the cases). Studies about the spread of toxoplasmic infection in different age groups have shown an incidence of this infection that increases with age (5). This is evidenced also by other researchers (6). In one study conducted by Gusmari, the presence of specific antibodies ranged from 8% for ages 2-6 years to 28.1% for ages 7-15

years, and in 53.4% for individuals over 41 years of age (7). In another study, a prevalence of 40-50% was recorded in the age group 41-45 years (8).

Referring to the education level, we observed that positive values of seroconversion decrease, respectively 50.51% for patients that had performed elementary school, 32.30% for patients with high school graduation, and 17.18% for patients with a university degree. An interesting clinical fact is that men graduated at university were less affected by *Toxoplasma*; perhaps, this is related to their hygienic care in general and their nutritional care in particular. The highest level of lymphoglandular toxoplasmosis in less educated women is also mentioned in the literature (9).

Environmental conditions are important for oocyst

survival. Global warming has had serious implications on dispersion of infectious diseases like toxoplasmosis (10). Prevalence of Toxoplasmosis is high in humid tropical areas and low in hot and dry areas (1). The risk of infection increases when the weather is both warm and moist, or moderated and less moist; actually, moist conditions can increase oocyst survival during longer periods of heat.

Prevalence of antibodies against *T. Gondii* has been linked to an interaction between temperature and rain (11,12). In this regard, Albania is localized in the Mediterranean region, in the band of subtropical climate, with optimal conditions for the protection and spread of these protozoa. Also, it is observed the presence of Toxoplasmosis in 18 regions of Albania. Tirana is the city with highest level of cases because of the movement of the population to the capital. There was no significant difference in prevalence between the rural and city dwellers. This fact is also described by other authors (13). Further urbanization may heighten the interaction between domestic or stray cats and wild animals, thus affecting the presence of *T. Gondii* in the environment (14). All of the data above show that infection may be present in all men with different education, also described in the literature (15). Toxoplasmosis is a disease which is present in all seasons of the year. The findings of our study indicate that Toxoplasmosis is observed in all months of the year and all seasons in Albania. These data are referred by other authors too (16). In our study, the majority of the clinical cases happened in the following seasons: spring, summer and autumn, with 264 (90.7%) of the cases.

Regarding risk factors, we noted that among 219 of our clinical cases, only 119 of them reported for contacts with cats. The distinctly low prevalence of toxoplasmosis in Hong Kong can probably be attributed to the absence of cats in most domestic households (13). However, there are authors showing that owners of domestic animals are not necessarily more infected than the others (17). There are authors that show the importance of *T. Gondi* transmission

by foods (3). Indeed, undercooked meat consumption remains the major risk factor for Toxoplasmosis (9). The risk related to meat consumption (lamb, pig, or calf) varies between different countries according to their eating habits, the prevalence of infected animals, and the means of meat production. In Albania, the most used meat is the calf and chicken meat, due to their low cost. Pig meat, because of the religion (Muslim religion is the predominant denomination in Albania) is less consumed. On the other hand, the preference well-cooked meat (commonly beef and pork) and the absence of cats in most domestic households are indicators of the low prevalence of Toxoplasmosis in Hong Kong (13). Another study reported that Toxoplasma as part of the microbic trial (Salmonella, Listeria and Toxoplasma) is the cause of more than 75% of food-borne deaths. The consumption of scallops is another risk factor for Toxoplasmosis (18). Evidence suggests that oocyst-induced infections in humans are clinically more severe than tissue cyst-acquired infections. In our study, we observed a large percentage of patients that consumed tap and well water, with 77 (71.29%) of the cases.

Waterborne transmission of *T. Gondi* is not considered uncommon (19-21). Oocystes can be infectious for a long period in water and may resist in cold and warm temperatures in water. They cannot be destructed by chemical substances and physical methods used in the treatment of water, including chlorination and ozone treatment. Contaminated water and land may be part of oocysts' transport in vegetables and fruits for human consumption. Therefore, consumption of unwashed and untreated fruits and vegetables lead to high risk for primary infection (22).

In conclusion, our study provides useful evidence about the distribution of Toxoplasmosis in Albania. Education of the general population and continuous education of health professionals are important means for an effective control and prevention of this infectious disease.

Conflicts of interest: None declared.

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