

Surveillance of toxoplasmosis in pregnant women in Albania

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SUMMARY

This study presents the initial results derived from a collaborative project aimed at the surveillance of the toxoplasma infection in a population of 496 Albanian pregnant women.

From October 2004 to March 2005, serum samples were tested to detect IgG, IgM and IgG avidity for toxoplasmosis. Of the 496 pregnant women examined, 241 (48.6% [range 44-53]; IC 95%) resulted positive for IgG, three of whom (1.3%) were also positive for IgM.

As the preliminary results of our survey disclose the absence of an efficient pre-gravidic screening and counseling for the prevention of toxoplasmosis in Albania, we propose a health education program for all pregnant women, together with serological testing (screening) for those exposed to predictors of toxoplasmosis infection as an epidemiological support and financially sustainable alternative.

KEY WORDS: Pregnancy, Toxoplasmosis, Serological test, IgG, IgM, Pre-gravidic screening

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INTRODUCTION

Albania is a developing nation which is progressively attempting to increase its social, economic and medical relationships with western Europe. However, as its healthcare system requires further development, the current data on the epidemiology of some infectious diseases remain incomplete. In particular, there is a lack of information on the seroprevalence of toxoplasmosis in pregnancy, a serious health problem in various countries. Herein, we present the initial data derived from a collaborative effort between the Clinic of Infectious Diseases of the

University of Bari and the Albanian Institute of Public Health whose aim was the surveillance of toxoplasma infection among pregnant women in four Albanian cities.

PATIENTS AND METHODS

A population of 496 Albanian pregnant women, attending general outpatient medical facilities in four provinces (Durrës, Shkoder, Tirana and Vlore) of the country was evaluated. All family physicians working in the outpatient facilities of these provinces were contacted. A total of four medical centers adhered to the project (one for each province). The study lasted six months (from October 2004 to March 2005). All the pregnant women enrolled provided informed consent; none of the women declined participation. The study was supervised by experts from the Italian Institute of Public Health (SN) and Albanian Institute of Public Health (BS and BN).

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Data was collected regarding age, occupation, city of origin, degree of education and possible exposure to risk factors for toxoplasmosis infection. None of the enrolled subjects had been subjected to pre-gravidic screening for toxoplasmosis, despite the fact that screening for toxoplasma, rubella and cytomegalovirus is mandatory in pregnant Albanian women.

The Bio-Merieux Vidas system to detect IgG, IgM and IgG avidity for toxoplasmosis was utilized. This is an automatic quantitative system based on an enzyme-linked fluorescent assay technique which associates a two-step sandwich immune enzymatic method with a final quantitative determination using fluorescence. IgM positive women were also tested for the rheumatoid factor with a Wiener kit.

RESULTS

The mean age of the women was 27 years (range: 16-48). Patient characteristics regarding employment, city of origin, degree of education, risk fac-

tors and serology are summarized in Tables 1 and 2. Of the pregnant women examined, 241 (48.6% [range 44-53]; IC 95%) were positive for IgG. Employment, city of origin and degree of education were similar among the general population examined and the IgG-positive women, while among the risk factors, a high percentage of IgG-positive women (21.5%) reported frequent consumption of poorly cooked meat. Among the IgG-positive pregnant women, three (1.3%) were also positive for IgM, two of whom subsequently demonstrated a low avidity test signifying an acute infection (0.4% of the total population); the risk factor present for both patients was consumption of poorly cooked meat.

DISCUSSION

Toxoplasma gondii, an obligate intracellular coccidian, can paratize either humans or a wide range of other vertebrate species. Human infection is usually due to consumption of raw or poorly cooked meat containing bradyzoites, or

TABLE 1 - *City of origin, employment and serology of the population examined.*

	Total population (No. pts. 496)	*IgG+ (No. pts. 241)	IgM and avidity+ (No. pts. 2)
City of Origin			
Durres	57 (11.4%)	21 (4.1%)	0
Shkoder	71 (14.2%)	49 (16.5%)	0
Tirana	291(58.6%)	132 (54.7%)	1 (50%)
Vlore	77 (15.5%)	48 (19.9%)	1 (50%)
Employment**			
Lawyer	1 (0.2%)	0	0
Trader	10 (2.0%)	4 (1.6%)	0
Unemployed	376 (75.6%)	181(75.1%)	0
Economist	11 (2.2%)	6 (2.4%)	1 (50%)
Nurse	3 (0.6%)	2 (0.8%)	0
Teacher	18 (3.6%)	8 (3.3%)	0
Worker	29 (5.8%)	11 (4.5%)	0
Hairdresser	3 (0.6%)	1 (0.4%)	0
Translator	1 (0.2%)	0	0
Lab technician	1 (0.2%)	1 (0.4%)	0
Tailor	22 (4.4%)	12 (4.9%)	0
Student	12 (2.4%)	7 (2.9%)	1 (50%)
Agronomist	1 (0.2%)	1 (0.4%)	0
Private employment	2 (0.4%)	1 (0.4%)	0
Dentist	1 (0.2%)	0	0
Not determined	5 (1.0%)	4 (1.6%)	0

*Chi-square = 11.89, $p \leq 0.01$, distribution significant. **Chi square = 10.26, $p \leq 1$, distribution significant.

TABLE 2 - Degree of education, risk factors and serology of the population examined.

	Total population (No. pts. 496)	IgG+ (No. pts. 241)	IgM and avidity+ (No. pts. 2)
Degree of Education*			
None	4 (0.8%)	3 (1.2%)	0
Primary School	7 (1.4%)	3 (1.2%)	0
Middle School	272 (54.8%)	139 (57.6%)	0
High School	161 (32.4%)	70 (29%)	0
University	52 (10.4%)	26 (10.7%)	2 (100%)
Risk Factor ^{o**}			
Use of untreated water	12 (2.4%)	7 (2.9%)	0
No public garbage collection	19 (3.8%)	19 (4.1%)	0
Direct soil contact	72 (14.5%)	35 (14.5%)	0
Direct contact with cats	40 (8.06%)	30 (12.4%)	0
Direct contact with other animals	21 (4.2%)	15 (6.2%)	0
Rodents in home or surroundings	15 (3.0%)	5 (2.0%)	0
Frequent intake of poorly cooked meat	69 (13.9%)	52 (21.5%)	2 (100%)
Frequent intake of raw mild	21 (4.2%)	9 (3.7%)	0
No exposure	261 (52.6)	130 (53.9%)	0

^o= many patients referred more than one risk factor; *chi-square = 3.62, if $p \geq 1$, distribution is not significant; **Chi-square = 28.55, if $p \geq 0.01$, distribution is significant.

ingesting the oocysts from cat feces in soil, water or food; 90% of these cases are asymptomatic. It is estimated that 20 to 90% of the adult world population has had contact with the parasite [Galvan-Ramirez *et al.*, 1998] depending on the sanitary conditions of the country studied. In fact, toxoplasmosis infection is related to several factors including socioeconomic level, nutritional habits, age, and rural or urban setting [Spalding *et al.*, 2005].

At present, a seroprevalence above 50% in women of childbearing age has been reported in Western Europe, Africa and South and Central America with the highest infection rates during pregnancy reported in Belgium, Netherlands, Austria, Germany, Czechoslovakia, and some areas of Canada [Williams *et al.*, 1981; Gilbert *et al.*, 1999; Lebech *et al.*, 1999; Tizard *et al.*, 1977; Bowie *et al.*, 1997]. In Belgrade (Yugoslavia), in a retrospective study of risk factors for *Toxoplasma gondii* conducted on a population of 2936 resident females over a nine-year period (1988-1997), the overall infection rate was 69% with wide variations both over time and region [Bobic *et al.*, 1998; Bobic *et al.*, 2003]. A population moving from an area of low prevalence of infection during or before childbearing may be at increased risk. The frequency of toxoplasmosis acquisition

during pregnancy ranges from 1 to 2 per 1,000 pregnancies in several countries [Allain *et al.*, 1998; Jenum *et al.*, 1998; Horion *et al.*, 1990]. Congenital transmission can occur when a woman acquires the infection during pregnancy and transmits it to her fetus [McCabe *et al.*, 1998]. Congenital infection has a prevalence of 0.2-2/1000 births [Wong *et al.*, 1994]; in Europe, congenital toxoplasmosis affects between 1 and 10,000 newborn babies of whom 1% to 24% develop lesions [Zotti *et al.*, 2004].

The rate of IgG seroprevalence found in our study was similar to that observed in the rest of Europe (48.6%) while the UK and Scandinavia have a lower prevalence [Evengard *et al.*, 2001] and France and Belgium have reported a prevalence rate approaching 50% or more. It is noteworthy that the percentage of acute infection seems higher than that expected (0.4%). The interpretation of this latter finding is not simple because the risk of newly acquired infection in a population of pregnant women depends both on the rate of infection in that specific geographic area and on the number of people previously non-infected, therefore changes in the incidence of the acute infection over time within the same community may occur (De Pascale *et al.*, 2008).

Consequently, periodic surveys are required to

determine current risks for transmission of congenital toxoplasmosis.

The preliminary results of our survey disclose the absence of an efficient pre-gravidic screening and counseling for the prevention of toxoplasmosis. The counseling activity in the general medicine outpatient clinics is still not well-organized and the pre- and post-gravidic screening should be improved. Pilot projects are ongoing; for example, an outpatients' clinic devoted to pregnant women in Mamurras is currently active.

In conclusion, the improvement of a disease-specific surveillance system is warranted in Albania. Based on the above data, we propose a health education program for all pregnant women together with serological testing for those exposed to risk factors for infection as an epidemiological support and financially sustainable alternative.

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REFERENCES

- ALLAIN J.P., PALMER C.R., PEARSON G. (1998). Epidemiological study of latent and recent infection by *Toxoplasma gondii* in pregnant women from regional population in the UK. *J Infect* **36**, 189-196.
- BOBIC B., JEVREMOVIC I., MARINKOVIC J., SIBALIC D., DJURKOVIC-DJAKOVIC O. (1998). Risk factors for *Toxoplasma* infection in a reproductive age female population in the area of Belgrade, *Yugoslavia*. *Eur J Epidemiol.* **14** (6), 605-610.
- BOBIC B., NIKOLIC A., DJURKOVIC-DJAKOVIC O. (2003). Identification of risk factors for infection with *Toxoplasma gondii* in Serbia as a basis of a program for prevention of congenital toxoplasmosis. *Srp Arh Celok Lek.* **131** (3-4), 162-167.
- BOWIE WR, KING AS, WERKER DH., ISAAC-RENTON JL, BELL A, ENG SB, MARION SA. (1997) *Toxoplasma* Investigation Team. Outbreak of toxoplasmosis associated with municipal drinking water. *Lancet* **350**, 173-177.
- DE PASCHALE M., AGRAPPI C., BELVISI L., CAGNIN D., CERULLI T., CLERICI P., MIRRI P., MANCO M.T., CAVALLAI S, VIGANO F.F. (2008). Revision of the positive predictive value of IgM anti-*Toxoplasma* antibodies a san index of the recent infection. *New Microbiol.* **31** (1), 105-111.
- EVENGARD B., PETERSSON K., ENGMAN M.L., WIKLUND S., IVARSSON S.A., TEAR-FAHNEHJELM K., FORSGREN M., GILBERT R., MALM G. (2001). Low incidence of toxoplasma infection during pregnancy and in newborns in Sweden. *Epidemiol Infect.* **127**, 121-127.
- GALVAN-RAMIREZ M.L., GUILLEN-VARGAS C., SAAVEDRA-DURAN R., ISLOS-RODRIGUEZ A. (1998). Analysis of *Toxoplasma gondii* antigens with sera from toxoplasmosis patients. *Revista da Sociedade Brasileira de Medicina Tropical* **31**, 271-277.
- GILBERT R. (1999). Epidemiology of infection in pregnant women. In: Petersen E. & Amboise-thomas P, eds *Congenital toxoplasmosis: scientific background, clinical management and control*. Paris: Springer-Verlag France.
- HORION M., THOUMSIN H., SENTERRE J., LAMBOTTE R. (1990). 20 years of screening for toxoplasmosis in pregnant women. The Liege experience in 20,000 pregnancies. *Rev Med Liege* **45**, 492-497.
- JENUM P.A., KAPPERUD G., STRY PEDERSEN B., MELBY K.K., ESKILD A., ENG J. (1998). Prevalence of *Toxoplasma gondii* specific immunoglobulin G antibodies among pregnant women in Norway. *Epidemiol Infect* **120**, 87-92.
- LEBECH M., ANDERSEN O., CHRISTENSEN N.C., HERTEL J., NIELSEN H.E., PEITERSEN B., RECHNITZER C., LARSEN S.O., NORGAARD-PETERSEN E. (1999). Feasibility of neonatal screening for toxoplasma infection in the absence of prenatal treatment. *Lancet.* **353**, 1834-1837.
- MCCABE R.E., REMINGTON J.S. (1988). Toxoplasmosis: the time has come. *The New England Journal of Medicine.* **318**, 313-315.
- SPALDING S.M., AMENDOEIRA M.R.R., KLEIN C.H., RIBEIRO L.C. (2005). Serological screening and toxoplasmosis exposure factors among pregnant women in South of Brazil. *Rev. Soc. Bras. Med. Trop.* **38** (2), 173-177.
- TIZARD J.R., CHAUHAN S.S., LAI C.H. (1977). The prevalence and epidemiology of toxoplasmosis in Ontario. *J. Hyg. (Lond)* **78** (2), 275-282.
- WILLIAMS K.A.B., SCOTT J.M., MACFARLANE D.E., WILLIAMS J.M., ELIASJONES T.F., WILLIAMS H. (1981). Congenital toxoplasmosis: a prospective survey in the West of Scotland. *J. Infect.* **3**, 219-229.
- WONG S.Y., REMINGTON J.S. (1994). Toxoplasmosis in pregnancy. *Clin. Inf Dis.* **18**, 853-862.
- ZOTTI C., CHARRIER L., GIACOMUZZI M., MOIRAGHI RUGGENINI A., MOMBRÒ M., FABRIS C. MAROCCHETTI P., ALFIERI R., LETO R., RENZI N., MILANO R., LIEVE M.A., COLOZZA M., ZANELLA D., ANTONA G., MASCHERO M.C., TOSETTI F., BIGLIETTI D., NICOLETTA T., DE RENZI G., TINIVELLA F., DONATI M., FERRINI A., CROTTI G., COUCOURDE L., GUAZZETTI G.C., GERA A., MALABAILA A., DE NATALE C., RABOZZI M.L., GINARDI C., BUZZONE T., CANEPA C., FRUTTERO M., MASTRACCHIO G., VALLE S., TOPPINO M., FORNO N., BELLINGERI P., CARACCIO W., LAZZARA C., DECAROLI V., PEDRAZZI E., GOMELLA S., COLLABORATING GROUP. (2004). Use of IgG Avidità test in case definitions of toxoplasmosis pregnancy. *New Microbiol.* **27** (1), 17-20.