

Seroepidemiology of *Toxoplasma* Infection in the Women Aged 15 to 45 Years in Hamadan, West of Iran

Rabiee S. MD*, *Fallah M. PhD*, **Shirmohammadi A. MD*, **Serpoush H. MD*

**Department of Obstetrics & Gynecology;*

** *Department of Parasitology;*

School of Medicine, Hamadan University of Medical Sciences, Hamadan, Iran

Abstract

Background: There was not documented evidence of *Toxoplasma* infection in Hamadan previously, but a brief report of isolation of a *T. gondii* strain from a turkey that it had high virulence to mice. In order to study of *Toxoplasma* infection in the at risk population and to determine seropositivity in this target population, women aged 15 to 45 years, a study carried out in Hamadan.

Materials And Methods: A total of 360 blood samples collected randomly from general population of women, residents of Hamadan city. Sera were separated in laboratory and examined for *Toxoplasma* antibodies by Indirect Fluorescents Antibody Test (IFAT). A titer 1:20 considered as positive for *Toxoplasma* infection in the tested subjects.

Results: A total of 140 samples (38.9%) were positive at titer 1:20 or more. Frequency of different titers was as follows: 1:20, 22.8%; 1:100, 9.7%; 1:200, 3.3%; 1:400, 2.8% and 1:800 or more, 0.8%. Infection rate in the housewives were 56.3% and was significantly more than other groups ($P<0.001$). The most subjects had the titer 1:20. Seropositivity was increased significantly with age, duration of residence in the region, marital status, touching cats and illiterate individuals. No significant correlation was found between seropositivity and kind of drinking-water, vegetable and unfreezed, under-cooked meat consumption. The highest rate of infection observed in married women. We did not find any positive evidences in relation to transfusion history and seropositivity.

Conclusion: Regarding to other reports, this area has a relatively high seropositivity in this group. More studies are recommended to detect the incidence of infection in at risk women, as well as the congenital toxoplasmosis, which can be a problem in this area.

Keywords: *toxoplasmosis, seroepidemiology, Hamadan, Iran*

Introduction

Infection by protozoan parasite, *Toxoplasma gondii*, is widely prevalent in animals and humans throughout the world (1). The ingestion of food and water contaminated with oocysts from infected cat feces or the ingestion of tissue cysts from ingested meat are two major sources of *T. gondii* infection (1, 2). Prevalence rates vary from place to place for reasons that remain largely obscure. The highest recorded rate

(93%) occurs in women who prefer undercooked or raw meat. The importance of toxoplasmosis is primarily in the pregnant women, organ transplantations and immunodeficient individuals (3, 4). At yearly seroconversion rates of 3 to 5 per cent, fetal risk is highest because more mothers in the childbearing range of 20 to 30 years become infected. Congenital toxoplasmosis is a major problem in the most communities with high prevalence of *T.gondi* infection and study of

Correspondence: Dr Rabiee, Fatemeh Hospital, Hamadan.
E- mail: Rebieeso@yahoo.com , Tel fax : +988118277459

seroepidemiology of this infection among the women in reproductive age period, could provide applicable approaches to preventive measures (5). There was not any documented evidence of human *Toxoplasma* in this area previously, but a brief report of isolation of a strain from turkey with high virulence to mice (6). In spite of a limited study in a population referred to health centers in Malayer (7), doing a study in major cities of province, like the center of province, has great importance to estimate the burden of problem in this region.

Materials and Methods

Blood samples were collected randomly from 360 women aged 15 – 45 years, from various parts of Hamadan. Sera were separated and stored in the freezer - 20° C, examined by IFA test gradually.

Antigen was obtained from Pasteur Institute of Iran. Polyvalent anti-human conjugated serum and serum controls, purchased from Behring, Germany. Tests were performed according to Ghorbani et al (8). Data on age, marital status, parity, history of abortion, contact with cat, presence of cat in/or around the house, habit of undercooked-unfrozen meat ingestion etc, obtained using a questionnaire. Sera at dilutions 1:20 or more, considered positive and evidence of previous exposure to *T. gondii*. Statistical significance was tested by chi-square test using SPSS software.

Results

A total of 140 serum samples were positive by IFAT at titer 1:20 or more, which indicated a seroprevalence of 36.9%. Different titers of antibody are presented in table 1.

Age distribution, seropositivity in relation to educational status, occupation groups, duration of residence in Hamadan and marital status are shown in tables 2-6. Seropositivity was increased with age. The highest infection rate was found in the age group of over 40 years. The highest rate also was observed within the housewives (56.3 %), as well as in the illiterate

individuals (51.5%) and married people (18.9%) ($P<0.001$). No significant difference was found between individuals with history of abortion, having children with abnormality, consumption of undercooked meat and seropositivity.

A direct correlation observed between the length of living in this city and infection rate ($P<0.003$). Nobody showed the history of testing for toxoplasmosis.

Table 1: Frequency of *Toxoplasma* antibodies in 360 women aged 15- 45 years

| IFA Titers | Number | Frequency (%) |
|------------|--------|---------------|
| 0 | 218 | 60.55 |
| 1:20 | 82 | 22.77 |
| 1:100 | 35 | 9.72 |
| 1:200 | 12 | 3.33 |
| 1:400 | 10 | 2.77 |
| 1:800 | 3 | 0.83 |
| Total | 360 | 100 |

Table 2: Age distribution of *Toxoplasma* infection in women aged 15- 45, Hamadan, Iran

| Age groups | Positive | | Negative | |
|------------|----------|------|----------|------|
| | Number | % | Number | % |
| 15 – 19 | 7 | 19.4 | 29 | 80.6 |
| 20 – 24 | 43 | 42.6 | 58 | 57.6 |
| 25 – 29 | 31 | 31 | 69 | 69 |
| 30 – 34 | 26 | 44.1 | 33 | 55.9 |
| 35 – 39 | 13 | 50 | 13 | 50 |
| > 40 | 20 | 54.1 | 17 | 45.9 |
| Total | 140 | 39.5 | 220 | 60.5 |

Table 3: Seroprevalence of toxoplasmosis in relation to educational status

| Education | Positive | | Negative | |
|-------------------|----------|------|----------|------|
| | Number | % | Number | % |
| Illiterate | 35 | 51.5 | 33 | 48.5 |
| Primary School | 13 | 46.4 | 14 | 53.6 |
| Juniour H. School | 31 | 36.9 | 53 | 63.1 |
| High School | 21 | 37.5 | 34 | 62.5 |
| Academic | 30 | 42.3 | 41 | 57.7 |
| Not mentioned | 10 | 18.9 | 43 | 81.1 |
| Total | 140 | 39.5 | 220 | 60.5 |

Table 4: Seroprevalence of toxoplasmosis in relation to different occupation groups

| Occupation | Number | Frequency (%) |
|---------------|--------|---------------|
| Housewives | 115 | 82.2 |
| Workers | 9 | 6.42 |
| Gov. Employee | 2 | 1.4 |
| Teacher | 13 | 9.28 |
| Not mentioned | 1 | 0.7 |
| Total | 140 | 100 |

Table 5: Seroprevalence of toxoplasmosis in relation to duration of residence in Hamadan .

| Years | Positive | | Negative | |
|---------|----------|------|----------|------|
| | Number | % | Number | % |
| < 5 | 23 | 27.1 | 54 | 64.9 |
| 6 – 10 | 10 | 25 | 30 | 75 |
| 11 – 20 | 39 | 43 | 51 | 57 |
| > 20 | 68 | 47.9 | 75 | 52.1 |
| Total | 138 | | 39.5 | 60.5 |

Table 6: Seroprevalence of toxoplasmosis In relation to marital status

| Marriage | Positive | | Negative | |
|----------|----------|------|----------|------|
| | Number | % | Number | % |
| Married | 130 | 42.5 | 176 | 57.5 |
| Single | 10 | 18.5 | 44 | 81.5 |
| Total | 140 | 39.5 | 220 | 60.5 |

Discussion

The most studies on toxoplasmosis have been conducted on the general population or some subgroups like immunodeficient subjects and pregnant women. Because of some reports on congenital toxoplasmosis (9, 10), various epidemiological studies performed in some parts of Iran (11, 12). Higher prevalence rate reported from humid regions like northern parts of country. Regarding two different reports, 87% and 55.7% seropositivity documented from western and eastern parts of Caspian basin, respectively (13, 8). In the northwest mountainous region of Iran, prevalence rate was from 6% to 23% (11), however, this was 9.3% to 29% at the southwest parts of country (11,12). Regarding to source of infection, pigs and lambs have main importance in the west

countries like the United States (3), with a relative importance of sheep and cattle. In contrast, the sheep and cattle seem encompass main role in distribution of *T. gondii* infection in the Islamic countries, e.g. in Iran (5, 6, 14). Although the meat consumption behavior had not significant association with seropositivity in our study, but probably, data collected by questionnaire must considered with precaution in the countries with low cultural and health-related knowledge. Seropositivity was raised with age and also had reverse relation with educational level. This matter indicates the raising of knowledge with higher education and the role of health education on the decrease of *T. gondii* infection, probably due to direct effect of environmental and cultural factors on *Toxoplasma* infection. Our findings are almost similar to another report from eastern part of this region, i.e. Malayer (7) and a little higher than neighbor province, Kermanshah (16).

According to some reports of *Toxoplasma* infection of intermediate hosts, such as sheep, goats, cattle, birds etc, it seems that the main route of human infection could be ingestion of under-cooked meat of abovementioned animals, particularly meat of sheep and lambs, which is the most common in all parts of Iran. There was no significant correlation between infection rate and habit of unfreeze undercooked meat consumption. Similar findings have been reported from other countries (17). The seroprevalence of the group of women of child-bearing age (between 20 and 40) was 40% in Zurich (14). The highest seroprevalence has been reported from France, both among women of reproductive age and the general population (11, 18). Lower prevalences are found in North America, South-East Asia and Oceania (17). We recommend further studies to determine the incidence of congenital toxoplasmosis in human, the prevalence of infection in the cats and other intermediate hosts in this region.

Acknowledgments

This work was supported in parts by financial grant of Research Department, Hamadan University of Medical Sciences, which is gratefully acknowledged. Moreover, we thank Miss Miadfar, for her technical assistance.

References

1. Dubey JP, Beattie CP. *Toxoplasmosis of animals and man*. Florida: Boca Raton, CRC press Inc, 1988
2. Frenkle JK. Transmission and illness. *J Am vet Med Assoc*. 1992; **196**:233 – 240.
3. Dubey GP. Strategies to reduce transmission of *Toxoplasma* infection to animals and humans. Aug.1995; Proceeding 15th. Int. Conf. World Assc. *Adv Vet Parasitol*. Yokohama, Japan.
4. Behr C, Pereira Da Silva LH. Progress in some anti-protozoan human diseases: leishmaniasis, toxoplasmosis, and malaria. In: Hausmann K and Hulsman N (Eds). *Progress in protozoology: proceedings of the IX international Congress of Protozoology*, Berlin 1993,. Stuttgart, Gustav Fischer, 1994.
5. Jacquier P, Nadal D, Zuber, P, Eckert J. The status of infection with *Toxoplasma gondii* in the Swiss population: contribution of a seroepidemiologic study from the Zurich canton. *Schweiz Med Wochenschr*. Suppl. 1995; **65**: 23s – 28s.
6. Ghorbani M, Gharavi MJ, Kahn moui A. Serological and parasitological investigations on *Toxoplasma* infection in domestic fowls in Iran. *Iranian J Pub Hlth*. 1990; **19**: Nos.1 – 4, 9–17.
7. Shahmoradi A, Sardarian K, Fallah M. Seroepidemiological survey of toxoplasmosis among the health centers referred in the Malayer city. *Shahed University Scientific Journal (Farsi)*. 1994; **2**: (5, 6), 70–73.
8. Ghorbani M, Edrisian GH, Assad N. Serologic survey of toxoplasmosis in northern part of Iran using IFAT. *Trans R Soc Trop Med Hyg*. 1978; **72**(4): 369 – 71.
9. Ghorbani M, Farzaneh I, Voshtani H, and Rezaian M. Congenital toxoplasmosis in Iran. *Iranian J Publ Hlth*. 1977; **6**: 1–5.
10. Ghorbani M, Hafizi A, Sanati A, and Modarress –Musavi H. Isolation of *Toxoplasma gondii* from human tissues. *Iranian J pub Hlth*. 1979; **8**: 23 –29.
11. Ghorbani M, Edrissian GH, Afshar A. Serologic survey of toxoplasmosis in mountainous regions of the north – west and south – west of Iran. *Trans R Soc Trop Med Hyg*. 1981; **75**(1): 38–9.
12. Sedaghat A, Ardehali SM, Sedigh M, and Buxton M. The prevalence of *Toxoplasma* infection in Southern Iran. *J Trop Med Hyg*. 1978; **81**: 204-207.
13. Daryaei A et al. Seroepidemiology of Toxoplasmosis in the northern part of Iran, Guilan. 1994; (Thesis, unpublished).
14. Ghorbani M et al. Animal toxoplasmosis in Iran. *J Trop Med Hyg*. 1983; **86**: 73–76.
15. Hoghoghi Rad N. Prevalence of toxoplasmosis in human and animals in Ahwas, capital of Khoozestan province, South–west Iran. *J Trop Med Hyg Jun*. 1993; **96** (3): 16–38.
16. Athari A, Shojaeian S, Eliasi G, and Delfani K. Seroprevalence of *Toxoplasma* antibodies among pregnant woman in Kermanshah. *Med J Islamic Repub Iran*. 1994; **8** (2): 93–95.
17. Zuber P, Jaquier P. Epidemiology of toxoplasmosis: World wide statues. *Schweiz Med Wochenschr*. 1995; Suppl. **65**: 19s – 22s.
18. Papoz L, Simondon F, Aurin W. et al. A simple model relevant to toxoplasmosis applied to epidemiological results in France. *Am J Epidemiol*. 1986; **123**: 154-161.