

Knowledge of university female students on the prevention of congenital toxoplasmosis

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Summery

Many studies evaluating the knowledge on toxoplasmosis have chosen pregnant women or their health-care providers as target groups, while young females of childbearing age are more appropriate candidate for knowledge assessment. A structured self-administered questionnaire was completed by a total of 200 female students, 100 from School of Nursing and Midwifery and 100 from School of Veterinary Medicine by their desire to participate in the study to evaluate their knowledge regarding toxoplasmosis. Average age of respondents was 23 (± 1.6) ranging from 20 to 31 years. Results showed that they possess an acceptable knowledge but only in a limited aspect of the parasite such as definitive host (86%), possibility of crossing agent through placenta (76.5%) and that consumption of undercooked meat is an important route of transmission (72.5%). However, a majority of respondents failed to identify soil contact as a significant transmission rate (53%); they also believed that the disease is preventable by vaccine (46%) and could be transmitted horizontally from person to person (56%). The results showed that our respondents had inadequate knowledge of some important aspects of the disease such as prevention of congenital toxoplasmosis. Considering the fact that the respondents were highly educated females of childbearing age, it may be concluded that the results overestimate the level of knowledge in the general population of childbearing age females. This highlights the importance of developing some specific educational programs for this high risk population.

Keywords: Childbearing age, Iran, Knowledge, Congenital toxoplasmosis.

Introduction

Toxoplasma gondii is a widespread zoonotic protozoan that infects most, if not all, species of birds and mammals. It has been estimated that one third of the world population has been infected and the prevalence is higher in tropical area. Human can be infected by consuming meat and meat products contaminated by *T. gondii*

tissue cysts and contact with the environment contaminated with sporulated oocysts (Peterson et al., 2010).

Primary infection with *T. gondii* is usually asymptomatic. However, it can be transmitted to the fetus across the placenta in pregnant women, causing congenital toxoplasmosis. Although congenital toxoplasmosis is rare, it may cause severe

complications, including fetal death and abortion and syndromes that include neurologic and neurocognitive deficits and chorioretinitis. Toxoplasmosis is spread all around the world and seropositive rates range from less than 10% to over 90%. The global estimated incidence of congenital toxoplasmosis is 190,100 cases per year (95% CI: 179,300–206,300). This amounted to an incidence rate of approximately 1.5 cases of congenital toxoplasmosis per 1000 live births (Targerson and Mastroiacovo, 2013).

There are several reports for seroprevalence of toxoplasma from Iran. Most reported seroprevalences of toxoplasma in pregnant or childbearing age women from various parts of Iran ranges between 15 to 44.8% (Taravati and Sadeghkhali, 2003; Abdi et al., 2008; Fallah et al., 2008; Jafari et al., 2012; Davami et al., 2014), although higher seroprevalences have been reported from northern region of the country (Saeedi et al., 2007; Youssefi et al., 2007). A recent meta-analysis (Daryani et al., 2014) estimated that the overall seroprevalence rate of toxoplasma among the general population in Iran is 39.3% (95% CI: 33.0-45.7%). It seems that a significant proportion of childbearing age women are seronegative, they represent a high-risk group in pregnancy. Such women need to be educated, because much of congenital toxoplasmosis can be preventable by simple precautions.

Almost all studies concerning the evaluation of knowledge about toxoplasma have chosen pregnant women or their health-care providers as target groups

(Pawlowski et al., 2001; Jones et al., 2003; Kravetz and Federman, 2005; Pereboom et al., 2013). However, we know that many women may not seek prenatal care as soon as pregnancy begins. Also, we acknowledge that the exposure to acquired infection in the first trimester of pregnancy causes more severe congenital outcomes (Jones et al., 2001). Taken together, it could be suggested that young women of childbearing age are a more appropriate candidate for knowledge assessment and educational interventions, if needed. Therefore, the objective of the present study was to determine the basic knowledge of young females in childbearing age regarding toxoplasmosis. We selected two groups of university students, one from the veterinary school and the other from the nursing-midwifery school to compare their knowledge base on this issue.

Materials and Methods

This is a cross-sectional study that was conducted in Shiraz, south-west of Iran. Target population consisted of all female students from Shiraz University of Medical Science, Fatemeh School of Nursing & Midwifery (P.B.U.H) as well as School of Veterinary Medicine of Shiraz University. A total of 200 students were selected from the target population by their desire to participate in the study. A structured self-administered questionnaire was designed to evaluate the knowledge of students on toxoplasmosis. The questionnaire consisted of two parts; demographic information and knowledge part. Demographic section was comprised of age, year of university entrance and educational status of parents.

The questions in the second section were multiple choice questions mainly about the etiologic agent of toxoplasmosis, the definitive host for the agent, routes of transmission, clinical manifestations, at risk groups, and prevention and control of the disease. Completed questionnaires were collected by the authors and the data were entered into the excel spreadsheets for further analysis.

For statistical analysis, data were transferred to SPSS software (Version 18). Mean and standard deviation (SD) for the age of respondents and their parents' educational status were calculated. To analyze questions, true and false status of each was determined and proportions of true responses were calculated. The true responses were compared between veterinary and nursing schools students using Chi-square analysis; and blank field in the questionnaire was considered as false answer. In addition, zero and one scores were attributed to false and true choices of each question, respectively. Therefore, the total knowledge scores were determined for each respondent. Due to the possibility of confounding, effect of age, year of university entrance and educational status of the parents, multiple linear regression analysis was used to compare the total knowledge scores between two groups. Total knowledge scores were considered as dependent variable and university entrance year, age, educational status of father and mother and school were considered as explanatory variables. Collinearity between variables was evaluated using Pearson's correlation coefficient. The association of these variables with the knowledge scores

was evaluated using univariable analysis and factors with $P < 0.25$ were introduced in the multivariable analysis. A final model was constructed using stepwise backward procedure. In all analysis, P-values less than 0.05 were considered as statistically significant.

Results

A total of 200 students, 100 from veterinary school and 100 from nursing school were selected for the study. Age of the participants was between 20 to 31 years old and total average was 23 ± 16 years. Summary statistics for the age of students and their parents' educational status are shown in Table 1.

In overall, proportion of correct responses to the questions in ascending were as follows: definitive host (86%), recognizing abortion in pregnant women as a significant manifestation of the disease (84.5%) and possibility of transmission of agent from mother to the fetus (76.5%), recognizing the pregnant women as a high risk group (74.5%), identifying mental retardation as another serious consequence of the infection (74%), and defining consumption of undercooked meat as an important route of transmission (72.5%). Figures 1 and 2 indicate the distribution of true status for some of questions categories according to the type of school. For most of the questions, there were significant differences between two groups of students, favoring veterinary students ($P < 0.05$).

Total knowledge scores for two groups of students are presented in Table 1. Because there was a possibility for age, year of university entrance and educational status

of parents to act as confounding effect for comparison of two groups of students, multiple regression analysis was performed to compare the total knowledge scores. With univariable analysis, all factors were associated with the total knowledge scores at $P < 0.25$. However, there was significant association (collinearity) between educational status of mothers and fathers ($r = 0.7$, $P < 0.001$). Therefore, only mother's educational status that showed strong association with the dependent variable

($P = 0.15$ vs $P = 0.23$) was included in the multiple regression model. Final regression model (Table 2) showed that the type of school and university entrance year were significantly associated with the total knowledge scores of the students ($P < 0.05$). Age and mothers' educational status were omitted from the final model. The final regression model was responsible for the 28% of all variations in the total knowledge scores.

Table 1. Mean \pm SD for the age and parents' educational status of respondents compared between veterinary and nursing students.

	Veterinary students	Nursing students	P-value
	Mean \pm SD	Mean \pm SD	
Age (years)	23.3 \pm 1.7	22.6 \pm 1.6	0.003
Education level of fathers (years)	13.3 \pm 4.4	11.4 \pm 4.1	0.007
Education level of mothers (years)	10.9 \pm 4.7	9.5 \pm 4.1	0.054
Total knowledge scores*	14.0 \pm 2.8	10.3 \pm 4	0.001

*Maximum total: 20 scores

Table 2. Results of multiple regression analysis for comparison of knowledge scores about toxoplasmosis between veterinary and nursing students.

	B ^a	SE ^b	β ^c	t	P-value
Constant	59.124	17.161	-	3.445	0.001
School*	-1.769	0.272	-0.458	-6.508	<0.001
University entrance year	-0.516	0.205	-0.177	-2.517	0.013

Model $R^2 = 0.28$; a: regression coefficient; b: standard error; β : standardized coefficient

*Veterinary School was coded as 0, and Nursing School as 1.

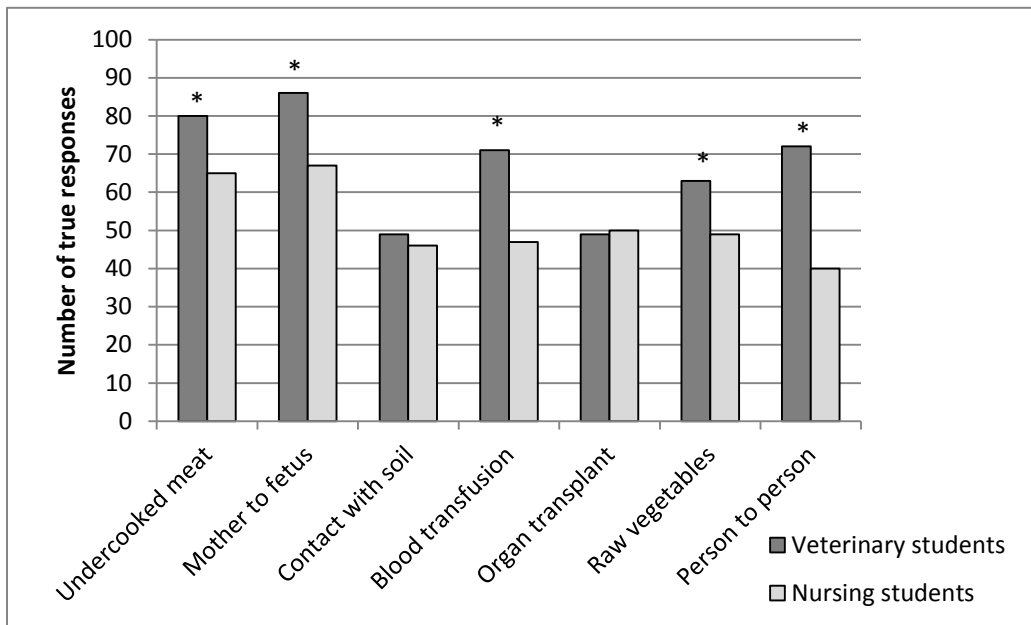


Fig 1. Comparison of knowledge about transmission routes of *Toxoplasma gondii* between veterinary and nursing students. Asterisks show significant differences between groups ($P<0.05$).

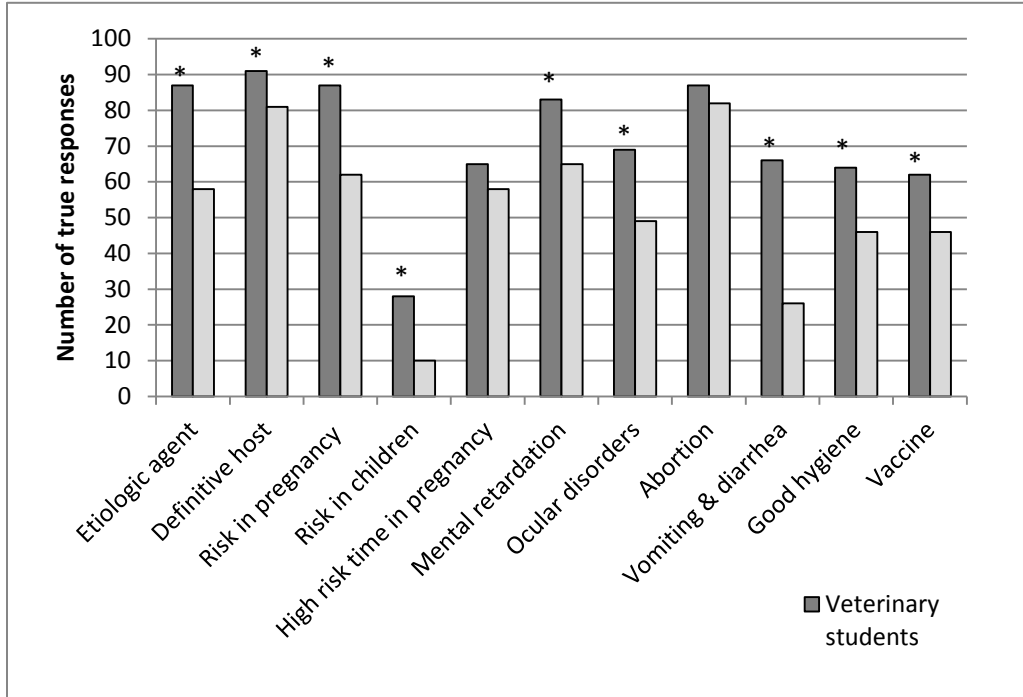


Fig 2. Comparison of general knowledge about *Toxoplasma gondii*, its manifestations and control measures between veterinary and nursing students. Asterisks show significant differences between groups ($P<0.05$).

Discussion

We assessed the knowledge base of two groups of young women in childbearing age from university students regarding the ubiquitous intracellular parasite, *Toxoplasma gondii*. We selected veterinary school and nursing-midwifery school, because both are contextually related to the study of disease. Our expectation was that these groups will reveal a good state of knowledge about toxoplasmosis. The results showed that they possess an acceptable knowledge, but only in a limited area of the parasite information.

Previous studies indicated that consumption of undercooked meat is the most significant risk factor for seroconversion and thus primary infection with toxoplasma during pregnancy (Kapperud et al., 1996; Bobic et al., 1998; Baril et al., 1999; Cook et al., 2000; Babaie et al., 2013). Based on our results, a significant proportion of both groups (72.5%) correctly recognized consumption of undercooked meat as an important route of transmission; the proportion is higher when compared with reports from previous studies. For example, in a study which was conducted on 102 obstetricians, internists and family practitioners to assess their knowledge of risk factors for toxoplasmosis infection as well as their practices for primary prevention counseling of pregnant women, the most likely method for transmission of toxoplasmosis was identified by 58% of respondents as changing cat litter, and only by 28% of responders as eating undercooked meat (Kravetz and Federman 2005). Another study of 403 pregnant women showed that only 30% of

respondents indicated that the organism that causes toxoplasmosis may be found in raw or undercooked meat (Jones et al., 2003).

Similar to the results of Jones et al (2003) on pregnant women, the highest level of knowledge in the present study was about the association between cats and toxoplasmosis. The other area of good knowledge was the recognition of the ability of the agent to pass through the placenta and infect the fetus during pregnancy, and causes abortion or mental retardation as significant manifestations of the disease. However, more than half of the respondents indicated the diarrhea and vomiting as a clinical manifestation of the disease and nearly half of them believed that the disease is preventable by vaccine. The belief that a disease is preventable by vaccination may induce a false confidence and result in low attention to main aspects of real preventive measures.

In addition, more than half of the participants thought that the disease could be transmitted from an infected person to others and also failed to recognize the contact with soil as another important route of disease transmission. Previous works demonstrated that soil contact is an important risk factor for *T. gondii* seroconversion in pregnant women (Kapperud et al., 1996; Bobic et al., 1998; Baril et al., 1999; Babaie et al., 2013). This implies that one important route of exposure to toxoplasma may be ignored by the majority of our respondents.

Interestingly, there were significant differences between veterinary and nursing students for most of the questions as well as for the total knowledge scores. Veterinary students revealed a higher level of

knowledge compared with nursing-students. One reason may be the fact that veterinary students learn about the disease in more than a single course, due to relation of the disease in human, cat, sheep and cattle. University entrance year similarly showed significant association with the students' knowledge, with the lower knowledge in more recent entered students. Age showed significant association in univariable analysis, but it was no longer significant in the multivariable model. This may indicate that students earned their knowledge primarily via their higher education and at the university rather than from the other sources. This finding is in agreement with previous works which have shown that regarding the key questions about toxoplasmosis in pregnant women, knowledge often increased with higher levels of education and less frequently with age (Jones et al., 2003; Babaei et al., 2013).

It is evident that much of congenital toxoplasmosis can be prevented by educating the target population. One approach for prevention toxoplasmosis is to focus on educating women of childbearing age for minimizing their risk of infection with *T. gondii*. Educational interventions assume that increased knowledge results in awareness, which consequently results in changes in risky behavior and declines in infection rates (Jones et al., 2001). The prevention guidelines for *Toxoplasma* infection emphasize food hygiene, especially through cooking of meat and meat products, and reduced contact with soil and cat feces (Peterson et al., 2010). Although the majority of our study participants showed a good knowledge about

Toxoplasmosis in some aspects, they had inadequate knowledge on some other important areas. On the other hand, it worth noting that the participants in the present study are not a representative sample of all young females at childbearing age. Rather, they are a biased sample with a tendency to overestimate the actual knowledge level of the population. This highlights the importance of developing specific educational programs for this high risk population in order to prevent the future cases of congenital toxoplasmosis.

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