Knowledge and Attitude Regarding Toxoplasmosis among Jazan University Female Students

Mohamed S. Mahfouz, Mona Elmahdy, Ahmed Bahri, Yara Mohammed Mobarki, Atheer Ali Altalhi, Norah Abdullah Barkat, Halimah Abdullah Al-Essa, Asmaa Hussein Ageely, Nesrin Ahmed Faqeeh, Nuha Abker Areeshi, Salma Mohammed Al-Hassan

Department of Family and Community Medicine, 1Faculty of Medicine, Jazan University, Jazan, Kingdom of Saudi Arabia

Abstract

Background: In Saudi Arabia, the prevalence of toxoplasmosis is high. However, to date, few studies have evaluated the degree of knowledge on toxoplasmosis among females in Saudi Arabia.

Objectives: The objective of this study was to assess the knowledge, attitude and preventive behavior regarding toxoplasmosis among female students at Jazan University, Jazan, southwest Saudi Arabia.

Materials and Methods: This cross-sectional study was conducted on a random sample of 440 female students at Jazan University using a semi-structured, self-administered questionnaire. Data with numerical/qualitative variables were expressed as frequency and percentage. Chi-square test was used to analyze categorical variables. \( P < 0.05 \) was used to indicate statistical significance.

Results: This study found that more than three-quarters (79.1%) of the students had insufficient knowledge about toxoplasmosis. Students from healthcare faculties had higher knowledge scores (28.5%) than students from arts and humanities (20.6%) and science (18.9%) faculties; however, the differences were not statistically significant \( (P = 0.77) \). The majority of the studied sample (92.3%) was found to eat fast food on a regular basis. About 42%, 54% and 4% of the respondents reported that they never, occasionally and always ate improperly washed vegetables, respectively.

Conclusions: This study found that a substantial proportion of Jazan University’s female students have insufficient knowledge on toxoplasmosis. Health educational programs are necessary to increase the awareness and knowledge about toxoplasmosis and its clinical manifestations.

Keywords: Awareness, Jazan, preventive behavior, Saudi, Toxoplasma gondii, toxoplasmosis

INTRODUCTION

Toxoplasma gondii is an intracellular opportunistic parasite that causes toxoplasmosis.\(^1\) It has a wide range of mammalian hosts and is transmitted by ingestion of food contaminated with oocysts from an infected cat, ingestion of undercooked meat containing cysts, transplacental transmission and gardening without gloves or through contact with soil.\(^2\)\(^-\)\(^4\)

Although most infected patients are asymptomatic, T. gondii infections have been found to be associated with fetal death, malformation or abortion in pregnant women and...
reproductive loss in animals. Further, *T. gondii* infections can cause multiple disorders including cognitive impairment. Recently, studies have also linked *T. gondii* infections to schizophrenia,[11] bipolar disorder[8] and epilepsy.[8]

In a review by Pappas et al.,[10] it was found that globally, the seropositivity of *T. gondii* rates range from <10% to >90%. According to Alsammani,[11] there is a high seropositivity rate of *T. gondii* infection among pregnant women in African and Arab countries, with African countries having a higher seropositivity (11%–83.6%) than Arab countries (7%–67.5%).

The prevalence of *T. gondii* in the Kingdom of Saudi Arabia has been found to vary, with the highest reported rate being in Jeddah (61.4%),[12] followed by Al Ahsa (51.4%),[13] Aseer (38.8%)[14] and Riyadh (38%).[13] A recent study conducted in Jazan, southwestern Saudi Arabia, suggested that the overall seroprevalence of *T. gondii* among pregnant women was 24.1%.[16] Despite its high prevalence rates, there is a scarcity of data on the knowledge and perception about this disease among women in Saudi Arabia. Therefore, this study aimed to assess the knowledge, attitude and preventive behavior regarding toxoplasmosis among female students of Jazan University.

**MATERIALS AND METHODS**

This cross-sectional study was conducted in Jazan, southwestern Saudi Arabia, over an 8-week duration (September 9 to November 2, 2015) and included female students from six faculties of Jazan University. The participants represented all academic years, and the age range was 18–25 years.

Using the sample size formula for a cross-sectional study design, the sample size for this study was calculated as 440 female students, with *P* = 50%, 95% confidence interval and error ≤5% and assuming a nonresponse rate of 10%. Participants were chosen as a percent proportionate to the number of the students enrolled in each faculty.

The questionnaire used in this study was developed in Arabic after review of the literature.[17,18] The questions were designed to assess the knowledge, attitude and preventive practices regarding toxoplasmosis among the female students. The questionnaire was pilot tested on 20 female students to assess its clarity and validity, and subsequently, adjustments were made where necessary. Students who participated in the pilot study were not included in the final analysis. The revised questionnaire was self-administered and collected data on age, education, socioeconomic status, residence and obstetric history. Specifically, the questionnaire also elicited the respondents’ knowledge on toxoplasmosis and its potential risk factors such as the presence of stray cats, history of blood transfusion, owning cats, direct contact or handling of domestic cats, eating raw or undercooked meat and improperly washed vegetables.

The collected data were checked for errors and analyzed using SPSS version 20 (SPSS Inc., Chicago, IL, USA). Data with numerical/qualitative variables were expressed as frequency and percentage. Further, the chi-square test was used where appropriate. *P* < 0.05 was considered as statistically significant. Further, a cutoff method was used to estimate the participants’ knowledge using an 8-item questionnaire, which included questions regarding causes, symptoms, mode of transmission, complications and reliable sources of knowledge about toxoplasmosis. A score of 1 was given for each correct response and 0 for incorrect responses. Individuals with ≥4 correct answers were considered to have high knowledge of toxoplasmosis.

This study was conducted in accordance with the ethical standards of the Kingdom of Saudi Arabia and the Declaration of Helsinki, 2013, guidelines. Participants were informed that they had the right to withdraw from the study at any time, their information would be kept anonymous and the data collected would only be used for scientific purposes. Further, verbal consent was obtained from each participant after explaining the objectives of the study. Ethical approval for this study (IRB 105-17) was provided by the Institutional Review Board of Jazan University.

**RESULTS**

Of the 440 randomly selected female students of Jazan University, most were aged 20–21 years (189; 43.0%) and 22–23 years (146; 33.2%). Of the six faculties of Jazan University from which the participants were selected, the highest proportion of respondents was from Faculty of Computer Sciences (133; 30.22%) and the lowest from the Faculty of Pharmacy (14; 3.18%). Only 152 (34.5%) of the participants were from urban areas. The majority of students 326 (74.1%) were single, while 96 (21.8%) were married. Further, 22.9% had cats at home [Table 1].

In terms of students’ knowledge regarding toxoplasmosis, the majority (348; 79.1%) had low knowledge scores [Table 2]. The difference in the knowledge scores by age group showed no statistical significance (*P* = 0.62). Students from urban areas had better knowledge scores than students from rural areas, but the difference was not statistically significant (*P* = 0.075). Health-care faculty students had
higher knowledge scores (28.5%) than those from arts and humanities (20.6%) and science (18.9%) faculties; however, the difference was not statistically significant ($P = 0.224$) [Table 2].

Regarding the respondents’ attitude toward toxoplasmosis, 51.4% of the studied sample did not consider toxoplasmosis to be a serious disease. About 55% of respondent believed that toxoplasmosis manifests with symptoms [Table 3]. The majority (56%) were unsure if toxoplasmosis affected pregnant women. About 48% were unsure if toxoplasmosis could cause miscarriage. Further, 48% were unsure if improperly washed vegetables spread toxoplasmosis, about 46% were unsure about toxoplasma being transmitted by blood transfusion and 39% agreed that it could be transmitted from a mother to fetus [Table 3].

Table 4 illustrates the responses regarding the participants’ infection preventive behavior. The majority (82%) of the respondents had never eaten undercooked meat or poultry; however, 1.4% reported that they always ate undercooked meat or poultry. Forty-two percent of respondents never eat improperly washed vegetables, whereas 4.3% reported that they always ate improperly washed vegetables. About 44% of the studied sample always eat fast food, while only 1.6% never ate it. Fifty-nine percent of the studied sample never eat fresh salad. On the other hand, only 3% always eat and 38% occasionally eat fresh salad. Only 9% of the respondents had been in contact with domestic animals, especially cats, while 61% had no contact with domestic animals.

**DISCUSSION**

The prevalence of toxoplasmosis in Jazan is sizeable, possibly because of the high-density of cat population in the region as well as its dusty weather. However, there was a lack of data on the knowledge, attitude and preventive behavior regarding this disease among females in this region. This study found that almost 80% of the Jazan University female students have inadequate knowledge regarding toxoplasmosis and about 50% do not consider it to a serious disease.

The inadequate knowledge about toxoplasmosis found in this study is consistent with the findings of other studies conducted in Saudi Arabia from Al-Ahsa and Dhahran in the region and the rest of the world. This study found that the knowledge of toxoplasmosis increases with age, which is in contrast with the findings of previous studies showing knowledge about toxoplasmosis is not associated with increase in age.

Another important finding of this study was that 55% of the respondents considered toxoplasmosis to be a serious disease.
symptomatic, and 56% were unsure if toxoplasmosis affected pregnant women. These findings suggest that a substantial portion of Jazan University female students are not aware about the symptoms of toxoplasmosis and the percentage is higher than that previously reported in Saudi Arabia,[24] pointing toward the need for raising awareness. This is important because although toxoplasmosis in pregnancy is mostly asymptomatic, recognizing symptoms can result in early diagnosis, and thus help reduce the risk of mother-to-child transmission of the infection.[25]

A previous study conducted in Jazan documented a significant relationship between seropositivity for toxoplasmosis and habitual fast food consumption.[26] About 44% of the respondents of this study reported that they always ate fast food, thereby suggesting that a substantial population of Jazan University female students are at high risk of toxoplasmosis. Consumption of raw meat and poultry was not significantly observed among the study participants, while consumption of undercooked meat and poultry was very rare. About one-quarter of the studied sample owned cats. According to the literature, close contact with cats or cleaning their litter is significantly associated with *T. gondii* infection,[4,25] however, a previous study conducted in Jazan found no significant association between owning cats and toxoplasmosis.[26] Further, 16.4% of the respondents stated that they ate improperly washed vegetables. Collectively, these results indicate that lack of knowledge may have led to lack of preventive measure adoption by the study participants, thereby indicating the need for health education programs. Pawlowski *et al.*[26] and Carter *et al.*[27] documented the importance of such educational program in preventing congenital toxoplasmosis, which is even more important among women in reproductive ages to reduce the seroprevalence of *T. gondii*.[24,28-30]

A limitation of this study is that as it was a self-administered survey, the accuracy of the study participant’s responses may be questionable. Another limitation is that the study population comprised undergraduate students, who are highly likely to have higher degree of knowledge than other women in Jazan; therefore, the results in this study represent the knowledge of only university students and not all women of Jazan. Finally, the study was based on cross-sectional study design and its results should be interpreted keeping this in mind.

**CONCLUSIONS**

More than three-quarters of Jazan University’s female students have inadequate knowledge about toxoplasmosis. Although the percentage of students following preventive practices is greater than the percentage of students with good knowledge regarding the disease, preventive measures are not universally applied. Thus, there is a need for establishing educational programs to increase the awareness of the population regarding toxoplasmosis, its risk factors, symptoms, transmission and preventive measures.

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**Conflicts of interest**

There are no conflicts of interest.

**REFERENCES**

1. Robert-Gangneux F, Dardé ML. Epidemiology of and diagnostic strategies for toxoplasmosis. Clin Microbiol Rev 2012;25:264-96.
2. Dahritz HA, Conrad PA. Cats and Toxoplasma: Implications for public health. Zoonoses Public Health 2010;57:34-52.
3. Dubey JP, Tiao N, Gebreyes WA, Jones JL. A review of toxoplasmosis in humans and animals in Ethiopia. Epidemiol Infect 2012;140:1935-8.
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4. Torrey EF, Yolken RH. Toxoplasma oocysts as a public health problem. Trends Parasitol 2013;29:380-4.
5. Robert-Gangneux F, Murat JB, Fricker-Hidalgo H, Brenier-Pinchart MP, Gangneux JP, Pelloux H, et al. The placenta: A main role in congenital toxoplasmosis? Trends Parasitol 2011;27:530-6.
6. Moncada PA, Montoya JJG. Toxoplasmosis in the fetus and newborn: An update on prevalence, diagnosis and treatment. Expert Rev Anti Infect Ther 2012;10:815-28.
7. Tanyüksel M, Uzun Ö, Araz E, Koru Ö, Babir C. Possible role of toxoplasmosis in patients with first-episode schizophrenia. Turk J Med Sci 2010;40:399-404.
8. Hamdani N, Daban-Huard C, Lajnef M, Richard JR, Delavest M, Godin O, et al. Relationship between Toxoplasma gondii infection and bipolar disorder in a French sample. J Affect Disord 2013;148:444-8.
9. Palmer BS. Meta-analysis of three case controlled studies and an ecological study into the link between cryptogenic epilepsy and chronic toxoplasmosis infection. Seizure 2007;16:657-63.
10. Pappas G, Roussos N, Falagas ME. Toxoplasmosis snapshots: Global status of Toxoplasma gondii seroprevalence and implications for pregnancy and congenital toxoplasmosis. Int J Parasitol 2009;39:1385-94.
11. Alsammani MA. Sero-epidemiology and risk factors for Toxoplasma gondii among pregnant women in Arab and African countries. J Parasit Dis 2016;40:569-79.
12. Tonkal AM. PCR versus ELISA in diagnosis of human toxoplasmosis in Jeddah, Saudi Arabia. J Egypt Soc Parasitol 2008;38:707-14.
13. Al-Mohammad HI, Amin TT, Balacha MH, Al-Moghannum MS. Toxoplasmosis: Seroprevalence and possible risk factors. Ann Trop Med Parasitol 2010;104:493-504.
14. Almushaidi MA, Dajem SM, Elsherbiny NM, Eskander MA, Al Azraqi TA, Makhlouf LM, et al. Seroprevalence and risk factors of Toxoplasma gondii infection among pregnant women in South Western, Saudi Arabia. J Parasit Dis 2014;38:4-10.
15. Almogren A. Antenatal screening for Toxoplasma gondii infection at a tertiary care hospital in Riyadh, Saudi Arabia. Ann Saudi Med 2011;31:569-72.
16. Aqel Y, El-Gayar EK, Perveen Khan D, Najmi A, Alvi A, Bani I, et al. Seroepidemiology of Toxoplasma gondii amongst pregnant women in Jazan province, Saudi Arabia. J Trop Med 2014;2014:913950.
17. Al Rashada N, Alqarash Z, Alshehi F, Alkhamees F, Alshaqeeq A. Toxoplasmosis among Saudi female students in Al-Ahsa, Kingdom of Saudi Arabia: Awareness and risk factors. Open J Prev Med 2016;6:187.
18. Elsaﬁ SH, Al-Mutairi WF, Al-Jubran KM, Abu Hassan MM, Al Zahrani EM. Toxoplasmosis seroprevalence in relation to knowledge and practice among pregnant women in Dhahrn, Saudi Arabia. Pathog Glob Health 2015;109:377-82.
19. Ebrahimi M, Ahmad A, Yaghfoori S, Rossou M, Azizadeh M. Evaluating the prior knowledge of toxoplasmosis among students of Ferdowsi university of Mashhad. Med J Islam Repub Iran 2015;29:163.
20. Andiappan H, Nissapatorn V, Sawangjaroen N, Khlaing SL, Salibay CC, Cheung MM, et al. Knowledge and practice on toxoplasma infection in pregnant women from Malaysia, Philippines, and Thailand. Front Microbiol 2014;5:291.
21. Jones JL, Ogunmodele F, Scheffel J, Kirkland E, Lopez A, Schullin J, et al. Toxoplasmosis-related knowledge and practices among pregnant women in the United States. Infect Dis Obstet Gynecol 2003;11:39-45.
22. Miller PR, Moura FL, Bastos OM, Mattos DP, Fonseca AB, Sudré AP, et al. Toxoplasmosis-related knowledge among pregnant and postpartum women attended in public health units in Niterói, Rio de Janeiro, Brazil. Rev Inst Med Trop Sao Paulo 2014;56:433-8.
23. Abdi J, Safarpour O, Biglari KH, Sayehmiri K. Female students’ knowledge on toxoplasmosis in Payame-Noor university of Ilam, West of Iran. Sky J Microbiol Res 2016;4:1-4.
24. Amin TT, Ali MN, Atrashid AA, Al Agnam AA, Al Sultan AA. Toxoplasmosis preventive behavior and related knowledge among Saudi pregnant women: An exploratory study. Glob J Health Sci 2013;5:131-43.
25. Fakhfakh N, Kallel K, En nigro S, Kaoueche E, Belhadj S, Chaker E, et al. Risk factors for Toxoplasma gondii and immune status of pregnant women: Cause and effect? Tunis Med 2013;91:188-90.
26. Pawlowski ZS, Gromadec-Sulkiewicz M, Skommer J, Paul M, Rokosowski H, Suchocka E, et al. Impact of health education on knowledge and prevention behavior for congenital toxoplasmosis: The experience in Poznań, Poland. Health Educ Res 2001;16:493-502.
27. Carter AO, Gelmon SB, Wells GA, Toepell AP. The effectiveness of a prenatal education programme for the prevention of congenital toxoplasmosis. Epidemiol Infect 1989;103:539-45.
28. Fonseca AL, Silva RA, Fux B, Madureira AP, Sousa FF, Margonari C, et al. Epidemiologic aspects of toxoplasmosis and evaluation of its seroprevalence in pregnant women. Rev Soc Bras Med Trop 2012;45:357-64.
29. Pereboom MT, Manniën J, Spelten ER, Schellevis FG, Hutton EK. Observational study to assess pregnant women’s knowledge and behaviour to prevent toxoplasmosis, listeriosis and cytomegalovirus. BMC Pregnancy Childbirth 2013;13:98.
30. Foulon W, Naessens A, Derde MP. Evaluation of the possibilities for preventing congenital toxoplasmosis. Am J Perinatol 1994;11:57-62.