

Knowledge and Attitude Regarding Toxoplasmosis among Jazan University Female Students

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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

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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

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reproductive loss in animals.^[5,6] Further, *T. gondii* infections can cause multiple disorders including cognitive impairment. Recently, studies have also linked *T. gondii* infections to schizophrenia,^[7] bipolar disorder^[8] and epilepsy.^[9]

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%).^[15] A recent study conducted in Jazan, southwest 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 $\leq 5\%$ 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 43% 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 1: Participants' background characteristics

Variables	Frequency (%)
Age groups (years) ($n = 440$)	
18-19	67 (15.2)
20-21	189 (43.0)
22-23	146 (33.2)
24-25	38 (8.6)
Faculties ($n = 440$)	
Applied Medical Sciences	48 (10.9)
Faculty of Pharmacy	14 (3.18)
Faculty of Computer Sciences	133 (30.22)
Faculty of Design and Architecture	78 (17.7)
Faculty of English	97 (22.0)
Faculty of Journalism and Media	70 (15.9)
Residence ($n = 440$)	
Urban	152 (34.5)
Rural	288 (65.5)
Marital status ($n = 440$)	
Married	96 (21.8)
Divorced	15 (3.4)
Widowed	3 (0.7)
Single	326 (74.1)
Cats ownership ($n = 440$)	
Yes	101 (22.9)
No	339 (77.1)

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 ate improperly washed vegetables, whereas 4.3% reported that they always ate improperly washed vegetables. About 44% of the studied sample always ate fast food, while only 1.6% never ate it. Fifty-nine percent of the studied sample never ate fresh salad. On the other hand, only 3% always ate and 38% occasionally ate 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.^[16] 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,^[17,18] in the region^[19] and the rest of the world.^[20-22] 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.^[23]

Another important finding of this study was that 55% of the respondents considered toxoplasmosis to be

Table 2: Knowledge score about toxoplasmosis according to age, residence and faculty

Variable	Knowledge scores			P
	Low ($n = 348$; 79.1%)	High ($n = 92$; 20.9%)	Total ($n = 440$; 100%)	
Age (years)				
18-19	54 (80.6)	13 (19.4)	67 (100)	0.062
20-21	159 (82.9)	30 (17.1)	189 (100)	
22-23	109 (76.2)	37 (23.8)	146 (100)	
24-25	26 (69.3)	12 (30.7)	38 (100)	
Residence				
Urban	113 (74.3)	39 (25.7)	152 (100)	0.075
Rural	235 (81.6)	53 (18.4)	288 (100)	
Faculty				
Health faculties	44 (71.5)	18 (28.5)	62 (100)	0.224
Science faculties	171 (81.1)	40 (18.9)	211 (100)	
Arts and humanities faculty	133 (79.4)	34 (20.6)	167 (100)	
Overall knowledge	348 (79.1)	92 (20.9)	440 (100)	

Table 3: Participants' attitude toward toxoplasmosis

Statement	Strongly agree, n (%)	Agree, n (%)	Not sure, n (%)	Disagree, n (%)	Strongly disagree, n (%)
Toxoplasmosis is dangerous	10 (2.3)	13 (3)	157 (35.7)	226 (51.4)	34 (7.7)
Toxoplasmosis have symptoms	46 (10.5)	196 (44.5)	179 (40.7)	11 (2.5)	8 (1.8)
Toxoplasmosis affect pregnant woman only	23 (5.2)	73 (16.6)	249 (56.6)	81 (18.4)	14 (3.2)
Toxoplasmosis could be transmitted by improperly washed vegetables and improperly cooked meat	51 (11.6)	121 (27.5)	211 (48.0)	44 (10)	13 (3)
Toxoplasmosis could be transmitted by blood transfusion	48 (10.9)	128 (29.1)	203 (46.1)	47 (10.7)	14 (3.2)
Toxoplasmosis could cause miscarriage or stillbirth	56 (12.7)	158 (35.9)	191 (43.45)	24 (5.5)	11 (2.5)
Toxoplasmosis could be transmitted from pregnant woman to her fetus	70 (15.9)	173 (39.3)	162 (36.8)	23 (5.2)	12 (2.7)

Table 4: Participants' infection preventive behavior

Questions	Always	Usually	Sometimes	Rarely	Never
Eating undercooked meats or poultry?	6 (1.4)	13 (3.0)	10 (2.3)	24 (5.5)	387 (88.0)
Eating improperly washed vegetables <10 min?	19 (4.3)	53 (12.0)	106 (24.1)	76 (17.3)	186 (42.3)
Eating fast food?	193 (43.9)	112 (25.5)	101 (23.0)	27 (6.1)	7 (1.6)
Do you prefer eat fresh salad without make sure it's washed properly?	15 (3.4)	29 (6.6)	65 (14.8)	69 (15.7)	262 (59.5)
Have you been in contact with domestic animals, especially cats?	42 (9.5)	37 (8.4)	43 (9.8)	47 (10.7)	271 (61.6)

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.^[22]

A previous study conducted in Jazan documented a significant relationship between seropositivity for toxoplasmosis and habitual fast food consumption.^[16] 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.^[16] 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.

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