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Short Communication

Seroepidemiology of *Toxoplasma gondii* Infection in Child Bearing Age Women in Dir Khyberpakhtunkhawa, Pakistan

Mushtaq Ahamd Khan[1], Ziaul Islam[2,*], Amin Ullah Jan[3], Kamran Khan[2] and Abdullah Shah[3]

[1]*Department of Zoology, Faculty of Sciences, Shaheed Benazir Bhutto University, Sheringal, Dir Upper, Khyber Pakhtunkhwa*
[2]*Department of Animal Sciences, Shaheed Benazir Bhutto University, Sheringal, Dir Upper, Khyber Pakhtunkhwa*
[3]*Department of Biotechnology, Shaheed Benazir Bhutto University, Sheringal, Dir Upper, Khyber Pakhtunkhwa*

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Authors' Contribution
ZI designed and planned the study. MAK executed the study. ZI and AUJ analysed the data and wrote the article. KK and AS critically reviewed the article and polished it for publication.

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ABSTRACT

Toxoplasmosis is the most prevalent parasitic zoonotic disease caused by *Toxoplasma gondii* that infects a wide range of warm-blooded animals including humans. Congenital infection with *T. gondii* during pregnancy can result in severe abnormalities in infants such as hydrocephalus and mental retardation. The present study was conducted to estimate seroprevalence and potential risk factors in acquiring *T. gondii* infection by child-bearing age women in Dir Khyber Pakhtunkhawa, Pakistan. A cross sectional study was conducted and data regarding risk factors were recorded through questionnaire. A total of 405 women of child bearing age were serologically tested for *T. gondii* antibodies through immuno-chromatographic technique using strips (CTK, USA) and Indirect Enzyme Linked Immunossorbant Assay (i-ELISA). The study revealed that overall 57.28% sero-prevalence was recorded in women of child bearing age. Highest (56.46%) seroprevalence was recorded in pregnant women as compared to non-pregnant women (43.53%). Highest (57.3%) sero- prevalence was recorded in women having 21-30 years age. Notably, the highest (25%) prevalence was reported in second trimester of pregnancy. Higher (52.6%) incidence of *T. gondii* infection was observed in illiterate women. The study demonstrates that age, low level of education, pregnancy, contact with cat and soil are the major risk factor of *T. gondii* infection.

Toxoplasmosis is one of the most prevalent zoonotic disease infecting wide range of warm-blooded animals including humans (Petersen *et al*., 2010; Torgerson and Macpherson, 2011). Approximately 6 billion people worldwide are infected with *Toxoplasma gondii* (Furtado *et al*., 2011). The causative agent of toxoplasmosis is an obligate intracellular protozoan parasite having cat as the definitive host and warm blooded animal including human are intermediate host (Dubey, 2010). The presence of *Toxoplasma* has been reported in every country and its prevalence ranges from 30% to 60% in both developed and developing countries (Flegr *et al*., 2003).

The seroprevalence of toxoplasmosis greatly varies among different geographic regions of the country and among different age group within the same area. *Toxoplasma* infection during pregnancy can result in spontaneous abortion, stillbirth, or a child that is seriously handicapped mentally and physically (Montoya and Rosso, 2005; Dubey, 2010). Toxoplasmosis is possibly a risk factor for personality shifts and reduced intelligence or schizophrenia (Dogruman *et al*., 2009). Screening of toxoplasma is very important in child bearing age women. It helps in identification of women at risk and contracting the infection and approach for the control of innate toxoplasmosis (Montoya and Liesenfeld, 2004).

Seroprevalence rate of *T. gondii* varies among different parts of the world (Tenter *et al*., 2000). The seroprevelance of toxoplasma has reported 70% in Indonesia, 81% in Ethiopia, 52% in Brazil, 10.8% in the U.S., 13.2% in Korea, 25% in Africa and 75% in Burkina Faso (Torgerson and Macpherson, 2011).

In Pakistan, toxoplasmosis is one of the neglected diseases and its prevalence is unknown among child bearing age women. Few studies are carried out in Pakistan

* Corresponding author: ziaulislam@sbbu.edu.pk
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to assess the prevalence among general population (Aleem *et al*., 2018). To prevent life threatening consequences of congenital Toxoplasmosis, it is important to study the epidemiology and potential risk factors of *Toxoplasma* infection in child bearing age women. Therefore, the present study was designed to investigate the overall Sero-prevalence and potential risk factors in acquiring *T. gondii* infection in child bearing age women in Dir Khyber Pakhtunkhawa Pakistan.

Materials and methods

A cross sectional study was conducted from May 2016 to October 2016. District Dir (L) is situated in north western part of KhyberPakhtunkhawa, Pakistan. Women population of child bearing age (14-55) was selected and blood samples were collected. Data regarding risk factors were recorded through questionnaire (age, qualification, marital status, pregnancy duration, raw meat, vegetable and milk consumption, hand washing after raw vegetable and meat consumption, residential place, house floor type, contact with soil, drinking water source, cat at home , contact with cat, livestock at home, contact with livestock, awareness about Toxoplasma). Sample size was calculated according to Thrusfield (1995). Blood samples (405) were collected and centrifuged at 3000 rpm for 10 min. The obtained serum was tested for *T. gondii* with the help of immuno-chromatographic technique using strips (CTK, USA). All samples were repeated through Indirect Enzyme Linked Immunossorbant Assay (i-ELISA) for *T. gondii* antibodies.

The data were statistical analyzed using (SPSS) and Microsoft Excel. To determine the association between seropositivity and potential risk factors Chi-square test was used.

Results and discussion

The overall seroprevalence of *T. gondii* infection in women of childbearing age was recorded as 57.28%, while among pregnant women seroprevalnce was recorded 56.46% and 43.53% were recorded among non-pregnant. The results of the present study are in line with the findings of earlier researchers (Mostafavi *et al*, 2012). They reported 57.60% and 47.50 % seroprevalence among child bearing age women in Timis, Isfahan and Iran respectively. Higher seroprevalence 65.71% was recorded in women of child bearing age in Malakand agency Khyber Pakhtunkhawa, Pakistan (Khan *et al*., 2014). Seroprevalance (60-75%) was reported in northern part of Iran (Youssefi *et al*., 2007; Sharif *et al*., 2006). Discrepancy in the results might be due to climatic condition, eating habits, possessing cat, life style, enrolled subjects and different sampling and analysis methods among different areas and studies.

Among positive cases of child bearing age women 7.80% were in age group 14-20 years, 57.30% were in age group 21-30 years, 26.30% were in age group of 31-40 years, 8.60% were in age group of 41-50 years. These results are in line with early findings (Khan *et al*. 2014). Prevalence in age group of 21-30 years from Khartoum State, Sudan was reported by were observed by Mohamed *et al*. (2013). Among positive cases of child bearing age women 7.80% were in age group of 14-20 years , 26.30% were in age group of 31-40 years, 8.60% were in age group of 41-50 years while no positive cases were recorded having age above 50 years. These results are in line with the findings Mohamed *et al*. (2013). Several studies have indicated an increase in seroprevalence with age (Techalew *et al*. 2009; Sroka *et al*. 2010) which might be due to accumulated opportunities for contact. These differences in results may be due to target group which were in age of 14-45 years which is considered as reproductive age.

Seroprevalence of *T. gondii* among pregnant women during different stages of pregnancy is presented in Figure 1. Different stages of pregnancy showed different percentage of seroprevalence among women. Higher seroprevalence25.00 %was recorded at second trimester (4-6 months), 15.90 % was recorded at first trimester (1-3months), followed by (15.00 %) at third trimester (6-9 months).

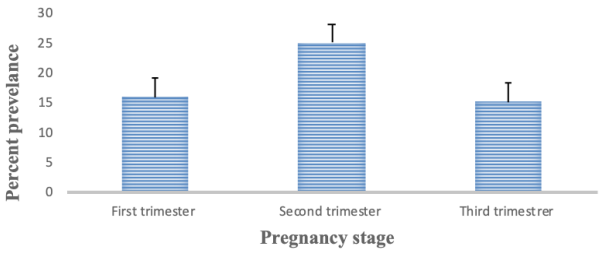

Fig. 1. Seroprevalence of *Toxoplasma gondii* infection among pregnant women according to stage of pregnancy i-e first trimester (1-3 months), second trimester (4-6 months) and third trimester (7-9 months).

The effect of different level of education on seroprevalence of *T. gondii* was presented in Figure 2. Education level showed a significant effect on seroprevalence of *T. gondii*. Those women having high education, the seroprevalence of *T. gondii* was minimum. Higher seroprevalence (52.6%) was recorded in illiterate women, followed by women having primary level of education (17.2 %). Similar findings were also reported by Gebremedhin *et al*. (2013) and Malarvizhi *et al*. (2012). Higher seroprevalence was recorded in illiterate women, followed by women having primary level of education. The results of the present study are an agreement with

the findings of previous researchers Doni *et al*. (2015). Jones *et al*. (2001) and Daryani *et al*. (2014) reported that *T. gondii* seroprevalence reduced with the increase in education level. With higher education level knowledge about awareness, prevention and controlling of disease as a source of infection increases which decrease chance of infection.

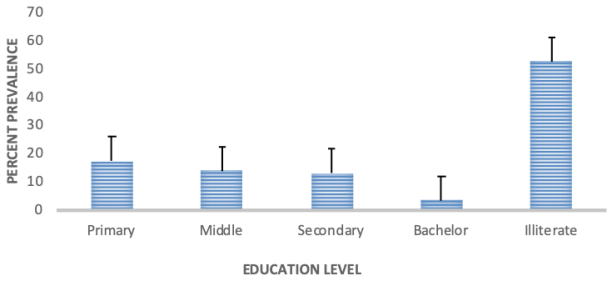

Fig. 2. Seroprevalence of *Toxoplasma gondii* infection in child bearing age women having different levels of education.

The comparison of different risk factors for Toxoplasma seropositvity is shown in Table I. Consumption of raw vegetables and raw milk was reported in 26.70 % and 27.70 %, respectively. Among the positive cases, 84.10 % women have contact with cat. Higher (74.60 %) seroprevalence was recorded in women living in rural areas as compared to urban areas (25.40 %). Prevalence in women living in house having soil floor was 56.90 %, consuming spring water was 35.30 %, and contact with soil was 66.4%. High (65.90 %) seroprevalence was recorded in women who had contact with livestock.

The current results consonant with the early findings of Njunda *et al*. (2011) and Liu *et al*. (2009) who reported that *Toxoplasma* infection as associated with raw vegetable consumption. High prevalence in those individuals who consume raw vegetable may be due to poor hygienic practices. Comparatively higher seroprevalence was recorded in women who have contact with cat. Similar findings were reported by Acha and Szyfres (2003) and Negash *et al*. (2008). The high seroprevalence in presence of cat in the household may be due to contamination of the environment with cat shaded oocysts which become infective for a long time in water or soil (Dubey, 2010). Higher prevalence was reported in rural areas as compared to urban areas. The current results are in consistent with the findings Ertug *et al*. (2005). The present study revealed that women living in rural areas, contact with soil and livestock, illiterate or primary education, low socioeconomic conditions are sensitive to *T. gondii* infection. The results of the present study are an agreement with the findings of some previous studies of Tammam *et al*. (2013), Senthamarai *et al*. (2013) and Siddiqui *et al*. (2014). Life style of the residents in the areas, there socioeconomic condition, contact with livestock and other related activities and favorable climatic condition may contribute for *T. gondii* oocysts sporulation and increase rate of infection (Liu *et al*., 2009).

Table I.- Association of risk factors and seropositivity among child bearing age women.

Factors	Category	Number of positive samples	Prevalence (%)
Raw vegetable consumption	+	62.00	26.70
	-	170.00	73.30
Raw milk consumption	+	64.00	27.60
	-	168.00	72.40
Raw meat consumption	+	0.00	
	-	232.00	100.00
Hand washing after handling raw meat	+	202.00	87.10
	-	30.00	12.90
Hand washing after handling raw vegetable	+	150.00	64.70
	-	82.00	35.30
Cat at home	+	27.00	11.60
	-	205.00	88.40
Contact with cat	+	195.00	84.10
	-	37.00	15.10
Exposure to soil	+	154.00	66.40
	-	78.00	33.60
Livestock at home	+	146.00	62.90
	-	86.00	37.10
Contact with livestock	+	153.00	65.90
	-	79.00	34.10
Making dong cakes	+	119.00	51.30
	-	113.00	48.70
Awareness about toxoplasmosis	+	48.00	20.70
	-	184.00	79.30

+ and -" denote Yes and No, respectively.

Conclusion

In present study potential risk factors to acquire *T. gondii* infection in child bearing age women was identified. The high seroprevalence of *T. gondii* infection was recorded in pregnant women, and those who have low level of education. Women living in rural areas are at high risk. The results of the present study help to alert the government and private sector to take initiative to control the overwhelming outcome of these zoonotic diseases.

Statement of conflict of interest

The authors state that there is no conflict of interest in publishing this work.

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