STUDY OF RISK FACTORS FOR TOXOPLASMA GONDII INFECTION IN PREGNANT AND NON-PREGNANT WOMEN IN WESTERN REGION OF LIBYA: USING QUESTIONNAIRE SURVEY

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Abstract

The study was conducted to determine the occurrence of risk factors of *Toxoplasma gondii* infection amongst pregnant and non-pregnant women at Sabratha Teaching Hospital and Surman Clinic. The study included cities from the Western region of Libya (Sabratha, Surman, El-Ajelat, Motred, Abo essa, Al-Sabreya and Tripoli). A total of 65 women, 41 pregnant and 24 non-pregnant with the average age from 20 and over 41 years were included in this study. Interviews were conducted using a structured questionnaire survey. The water consumed level originated from treated water (50.8%), mineral water (36.9%), wells water (10.8%) and taps water (1.5%).

The majority (87.7%) consumed Chicken meat more often, whilst (53.8%) consumed Beef, thoroughly cooked meat was preferred by (87.7%). Few (1.5%) used gloves when dealing with meat. All respondents washed fruits and vegetables before consumption, consumed milk was (66.2%) of the women, while (10.8%) preferred unpasteurized milk. Only (4.6%) of women owned cats, whilst 6.2% handling them, and 33.8% were in contact with soil. (47.6%) has O blood type. 63.1% of total respondents were pregnant women, of them 70% were aborted previously one time and 14.8% were aborted two times, 11% were aborted three times and 3.7% were aborted four times. The majority of them had some knowledge about toxoplasmosis but few known of the transmission mechanism. Also the study revealed that (3.70%) of aborted respondents was owning cats or dogs, 40.7% of them were dealing with soil and all previously aborted respondents were not using gloves while handling meat. Comparison between previous abortion incidences and consumption of milk showed that 70.4% of aborted women were consumed milk daily, and regarding water sources 55.6% of aborted respondents consumed treated water and 18.5% of them consumed wells or taps water. Knowledge of these risk factors will help to reduce and prevent toxoplasmosis. The study needs further health education to increase awareness of risk factors of toxoplasmosis.

Keywords: Congenital toxoplasmosis, Non pregnant, Pregnant, Risk factors, *Toxoplasma gondii* (*T. gondii*)

Introduction

Toxoplasmosis is a zoonotic disease caused by an obligate intracellular protozoan parasites caused by *Toxoplasma gondii* (Singh, 2003). *T. gondii* was described in 1908 by Nicolle and Manceaux in the blood, spleen and liver of North Africa rodent (*Ctenodactylus gundii*) in Tunisia (Singh, 2016). The first identification of *T. gondii* in humans was in 1938, at Babies' Hospital in New York City.

The most prevalent parasitic infections can see in humans and in warm-blooded animals. It has worldwide distribution in nearly one-third of the human population, especially in Europe, South America and Africa (Hill *et al.,* 2005 and Elsaid *et al*., 2014).

Humans become infected by ingesting raw or undercooked meat or contaminated fruits and vegetables, ingestion of materials contaminated with cat feces, and by transplacental infection (Montoya and Liesenfeld, 2004). In immunocompetent people, acute toxoplasmosis is usually asymptomatic (Dupont *et al.,* 2012), but in some infected people mild flu-like symptoms occasionally occur during the first few weeks following exposure (Flegr *et al.*, 2014).

Following the initial acute phase of infection the parasite assumes an asymptomatic latent (chronic) form, which found predominantly in nervous and muscle tissues in infected hosts (Flegr, 2007). Immunocompromised patients are at high risk of developing acute toxoplasmosis and reactivation of chronic infection that can cause damage to the brain or the eyes and may be fatal if untreated (Mittal and Ichhpujani, 2011).

In chronic Toxoplasmosis tissue cysts can be maintained in host tissue for the lifetime of the animal. However, the perpetual presence of cysts appears to be due to a periodic process of cyst or bradyzoites (Weiss and Kim, 2011). Primary infection during pregnancy may result in severe damage to the fetus, especially if acquired during the first and second trimesters of gestation (Singh, 2016) and may cause spontaneous abortion, prematurity or stillbirth in a proportion of cases. The classic features of severe congenital toxoplasmosis are fever, hydrocephalus or microcephaly, hepatosplenomegaly, slowly grow and jaundice (McAuley, 2014). Therefore, early diagnosis of *T. gondii* infection during pregnancy is very important to prevention of congenital toxoplasmosis. Cutaneous toxoplasmosis while rare, skin including, roseola and erythema, urticaria, and maculopapular lesions. Newborns may have punctate macules, ecchymosis, or "blueberry muffins" lesions (Barakat *et al.*, 2012).

Epidemiological studies recording the high prevalence of *T. gondii* infection in Latin America (about 50–80%), parts of Eastern and Central Europe (about 20–60%), the Middle East (about 30-50%), parts of Southeast Asia (about 20–60%), and parts of Africa (about 20–55%) (Pappas *et al.*, 2009).

The diagnosis of infection can be made directly by biological, serological, histological or molecular methods (Hill and Dubey, 2002). The most commonly used tests to measure IgG antibody is Sabin–Feldman dye test (DT), enzyme-linked immunosorbent assay (ELISA), indirect fluorescent antibody assay (IFA), and the modified direct agglutination test (Montoya, 2002).

The treatment is not needed for immunocompetent patients unless they have persistent and severe symptoms, but infected pregnant women should be treated with Spiramycin or Pyrimethamine plus Sulfadiazine, also immunocompromised patients are treated with the Pyrimethamine plus sulfadiazine, or Clindamycin and folinic acid (Mittal and Ichhpujani, 2011). The prevention of Toxoplasmosis is dependent on effective avoidance of infection as avoiding undercooked or raw meat and contaminated fruits or vegetables, drinking contaminated water and avoid close contact with cats and their feces.

Methodology

The study was conducted in the Western region of Libya, including Sabratha Teaching Hospital (STH) and Surman Clinic. The majority of women are 65, (41 pregnant and 24 non pregnant women). A cross-sectional study was undertaken at Sabratha Teaching Hospital and Surman Clinic between March and July (2017).

A structured questionnaire survey was prepared and conducted confidentially with each accepting participant, from which the following information was obtained: residence, sex, age, social status, educational level, occupation, average income, presence and handling of cats, dealing with soil, consumption of raw or undercooked meat, source of water, blood group, consumption of raw milk, consumption of unwashed vegetables or fruits, source of meat, using of gloves while handling meat, physiological condition and abortion.

Data entry and analysis

All of the responses to the questionnaires were entered into Microsoft Excel® 2007 (Microsoft Corporation, USA) followed by descriptive analysis using SPSS Version 21 (SPSS, Inc., Chicago, IL, USA). Data with quantitative variables were expressed as the mean +/-standard deviation (+/- s.d.) and range, whereas qualitative variables were estimated and presented as frequencies and percentages.

Results

A total of sixty five (65) women aged from 20 to over 41 years were involved in the study. The results showed that 63.1% (41/65) of respondents were pregnant women and 36.9% (24/65) were non-pregnant (Figure 1). Analysis of data collected showed that 6.2% of total respondents had no education levels (Figure 2), and regarding their occupation showed that 35.4% (23/65) were Teachers, 33.8% (22/65) were Housewife, 15.4% (10/65) have occupation in medicine field, 6.2% (4/65) were employee in other occupation fields and 9.2% (6/65) were students (Figure 3). The results also showed the majority (70.7%) 46/65 of the respondents had a good average income as shown in (Figure 4). Several risk factors for Toxoplasmosis were investigated in the survey and the analysis of data showed that 4.6% (4/65) of total population owned a Cats, whilst 6.2% (4/65) handling them, and 33.8% (22/65) were in contact with soil. The results also showed that 87.7% (57/65) of respondents eating thoroughly cooked meat and only 1.5% (1/65) using gloves when dealing with meat products. The data collected, showed 87.7% (57/65) preferred to eat chicken meat, 72.3% (47/65) lamb meat, 70.8% (46/65) camel meat and 53.8% (35/65) beef. Regarding milk consumption the results showed that 66.2% (43/65) of women drink milk, and 10.8% (7/65) of total population (7/65) were preferred to consume it without pasteurizing. The results also showed that all respondents washed fruits and vegetables before eating it, and about 50.8% (33/65) of respondents drink treated water, 36.9% (24/65) use mineral water, and 10.8% (7/65) drink wells water, whilst only 1.5% (1/65) were consuming taps water. All results of risk factors distribution are shown in (Table 1). The respondents asked about previous abortion accidents, and the results showed 41.5% (27/65) were aborted several times as shown in (Table 2). The relationship between the most prevalence risks factors and the previous abortion incidence showed that (3.70%, Std. deviation .577) of aborted respondents were owning cats or dogs in their home as shown in (Table 3). Regarding to contact with soil, the results revealed (40.7%, Std. deviation .512) of previously aborted respondents were dealing with soil as shown in (Table 4).The results also showed that (70.4%, Std. deviation .502) of aborted respondents were consumed milk daily (Table 5), and all of them (100%) were not wearing gloves while handling meat products (Table 6). And about water sources, the results show that (55.6%) of previously aborted women consumed treated water and (18.5%) of them consumed wells or taps water as shown in (Table 7).

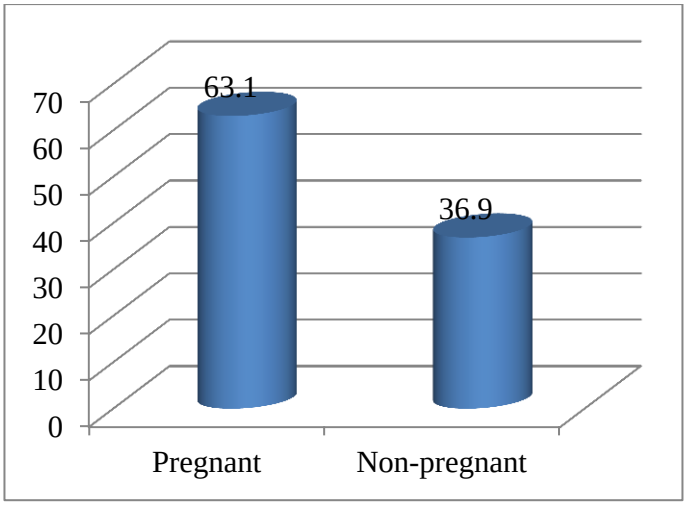


Figure 1: Frequency of physiologic status

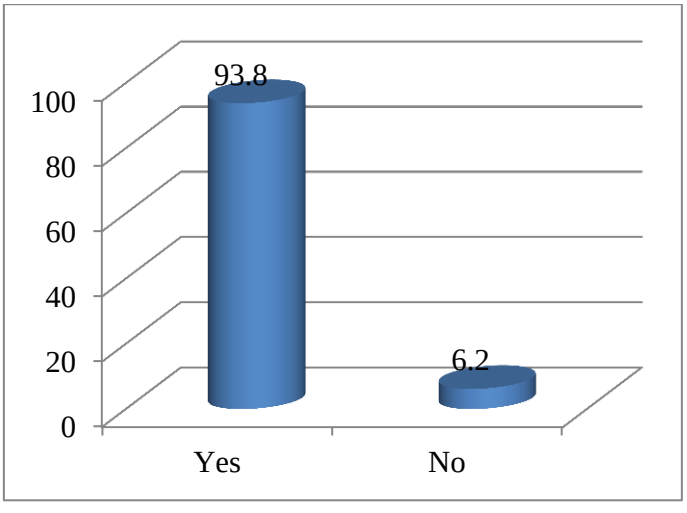


Figure 2: Frequency of education level

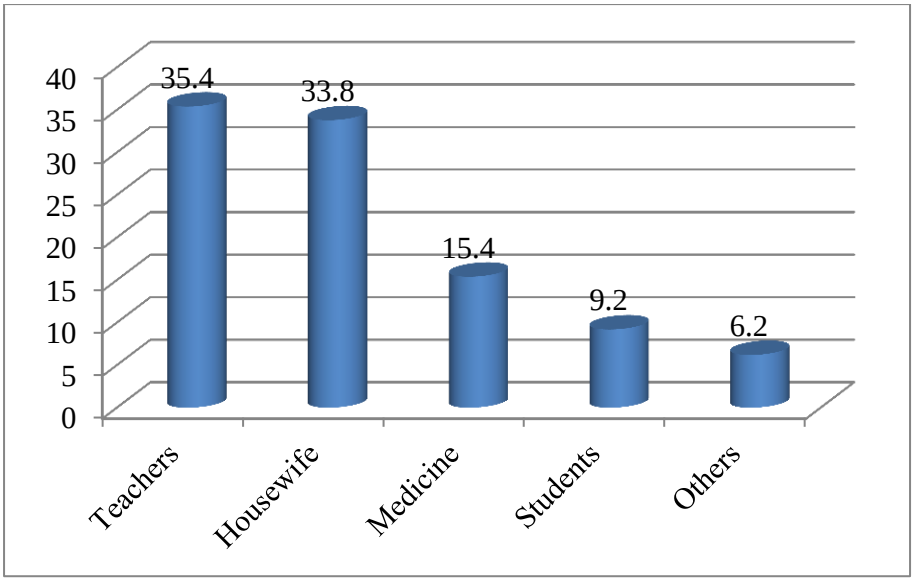


Figure 3: Frequency of occupation

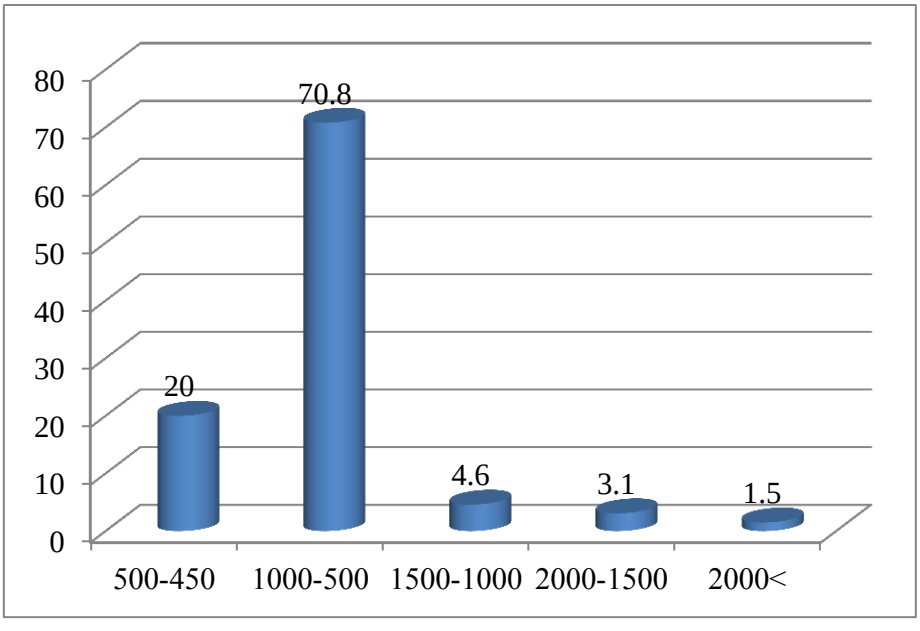


Figure 4: Frequency of average income

Table 1: Distribution of risk factors among respondents

Risk Factors	Response Level		Frequency (n)	Prevalence (%)
Owning a cat	Yes		3	4.6
	No		62	95.4
Handling of cats	Yes		4	6.2
	No		61	93.8
Contact with soil	Yes		22	33.8
	No		43	66.2
Eating raw or undercooked meat products	Yes		8	12.3
	No		57	87.7
Use gloves when dealing with meat	Yes		1	1.5
	No		64	98.5
Meat source	Chicken	Yes	57	87.7
		No	8	12.3
	Lamb	Yes	47	72.3
		No	18	27.7
	Camel	Yes	46	70.8
		No	19	29.2
	Beef	Yes	35	53.8
		No	30	46.2
Consumption of milk	Yes		43	66.2
	No		22	33.8
Consumption of unpasteurized raw milk	Yes		7	10.8
	No		58	89.2
consumption of unwashed vegetables or fruits	Yes		0	0.0
	No		65	100.0
Household water source	treated water		33	50.8
	mineral water		24	36.9
	wells water		7	10.8
	taps water		1	1.5

Table 2: The number of previous abortions among respondents

Number of abortion	Number of respondents	Percent (%)
0	38	58.5
1	19	29.2

2	4	6.2
3	3	4.6
4	1	1.5
Total	**65**	**100**

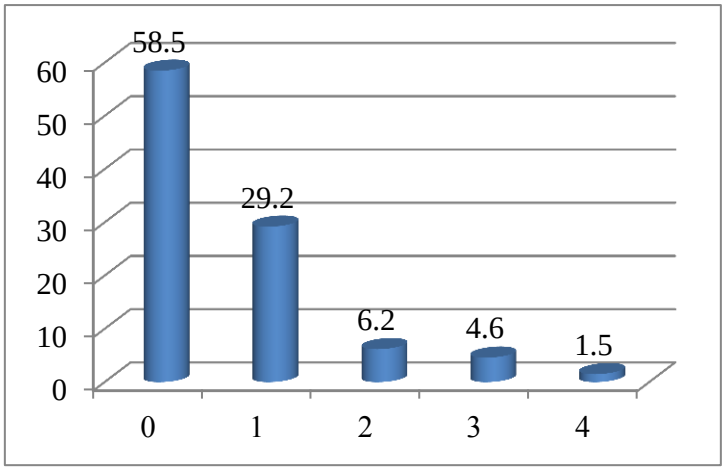


Figure 6: Frequency of number of abortions

Table 3: Relationship between abortion and owning cats or dogs

Abortion	N	Owning cats	N	Percent (%)	Std. Deviation
Yes	27	Yes	1	3.7	.577
		No	26	96.3	.497
		total	**27**	**100**	.497

Table 4: Relationship between abortion and dealing with soil

Abortion	N	Contact with soil	N	Percent (%)	Std. Deviation
Yes	27	Yes	11	40.7	.512
		No	16	59.3	.489
		total	**27**	**100**	.497

Table 5: Relationship between abortion and consumption of milk

Abortion	N	Consumption of milk	N	Percent (%)	Std. Deviation
Yes	27	Yes	19	70.4	.502
		No	8	29.6	.492
		Total	**27**	**100**	.497

Table 6: Relationship between abortion and using gloves while handling meat

Abortion	N	Using gloves while dealing with meat	N	Percent (%)
Yes	27	Yes	0	0
		No	27	100
		Total	**27**	**100**

Table 7: Relationship between abortion and water sources

Abortion	N	Source of water	N	Percent (%)
Yes	27	Treated water	15	55.6
		Mineral water	7	25.9
		Wells water	4	14.8
		Taps water	1	3.70
		Total	**27**	**100**

Discussion

Symptoms of congenital toxoplasmosis can occur when the fetus is infected with *Toxoplasma gondii.* The disease can be passed through placenta to developing baby if the mother becomes infected. Most of the time, the infection is mild in the mother but the woman may not be aware she has the parasite. However, infection of the a baby can cause serious problems, if infected in early pregnancy. Often, babies with mild infection are asymptomatic after birth but most children with this infection develop problems in their teens if not treated.

Symptoms during infection are enlarged liver and spleen, vomiting, eye damage from inflammation of the retina or other parts of the eye, feeding problems, hearing loss, jaundice (yellow skin), low birth weight, skin rash, vision problems, seizures and intellectual disability.

Residence, age, social status, occupation, average income, educational level, presence of cats, handling with cats and soil, consumption of undercooked meat,

blood group, consumption of milk consumption of unpasteurized milk, source of water, consumption of unwashed fruits and vegetables, source of meat, wear gloves, physiological condition were the major risk factors in the transmission of the disease.

In the present study, the previous risk factors among pregnant and non pregnant women in the Western region of Libya using questionnaire survey were determined.

The present study demonstrates that about 70.7% of respondent's women has an average income between 500 =>2000 DL. This results consistence with results of occupation and education levels of respondents, where 61 (93.8%) of them has an education level and over 90% of them has a job in different fields. Therefore, poverty, occupation and education levels does not considered as one of serious risk factors in Libya.

The study also showed that 4.6% respondents owned a cats, and 6.2% were handling them, the results may be due to the high levels of health awareness among most Libyans, however there is (33.8%) of respondents are in contact with soil, which was identified as a risk factor for *Toxoplasma* infection in pregnancy in previous studies (Baril *et al.,* 1996; Buffolano *et al.,* 1996; Kapperud *et al.,* 1996).

Regarding meat source 87.7% of respondents consumed chicken meat, and this is a highest percent compare to other sources (53.8 % beef, 70.8 % camel, 72.3 % lamb), the consumption of undercooked lamb meat, has been reported as the major risk factor for human *T. gondii* infection (Dubey & Jones 2008). Whereas regarding eating habits of meat products the results show that consumption of raw or undercooked meat in Libya is unusuall, where 87.7% of respondents preferred to eat well cooked meat, consumption of well cooked meat due to awareness is not be the principal mechanism by which pregnant are exposed to *T. gondii* infection.

The non-use of gloves as a result of low level of education increases the possibility of transmission of toxoplasmosis. In fact 98.5% of respondents don't use gloves when dealing with meat, reveals a significant association between wearing of gloves and *T. gondii* infection.

Most Libyans consumed milk, and that has confirmed in the current study, where 66.2 % of respondents in this study were consumed milk daily, and this indicates the major risk factors of Toxoplasmosis, as well as some of them preferred to drinking it without pasteurize (10.8%), this result may because some of them use it as treatment for some diseases as they believed. Study suggests that drinking raw milk from infected goats might be a possible route for the transmission of toxoplasmosis (Sacks *et al.,* 1982). Consequently that it is considered as a middle risk factors that cause transmission of *T. gondii* among people.

Of the results, the most respondents have a highest level of health awareness, where 0% of total respondents eats vegetables and fruits after washing or peeling them properly. Such practice could be a main source of *Toxoplasma* infection (Kapperud *et al.,* 1996).

The results of this study also show that treated water has the highest percent of respondents' household water source (50.8%), (Bahia-Oliveira *et al.,* 2003; Isaac-Renton *et al.,* 1998) reported water as a source of infection with *Toxoplasma gondii*, also 10.8 % of them consumed wells water, (Stroke *et al.,* 2006) recorded presence of *T. gondii* in well water, only 1.5% consumed taps water, therefore the household water sources is one of the potential risk of waterborne infection for humans.

In pregnant women *Toxoplasma* infections are considered to be one of the most common causes of miscarriage, especially in the first months of pregnancy. One of the most dangerous methods of transmission of this disease is the transmission of the placenta to the fetus. The risk is in the first months of pregnancy, placenta reaches 45%, 60% of this infection has no symptoms, 9% leads to fetal death, and 30% congenital malformations such as cerebral palsy and increased cerebrospinal fluid (CST). It also causes retinal changes that lead to blindness, as well as mental retardation and epilepsy. The study included 65 cases of which 63% of total respondents were pregnant women, of them 70% were aborted one time, 14.8% were aborted two times, 11% were aborted three times and 3.7% were aborted four times.

Miscarriage is one of the most common signs of congenital Toxoplasmosis in pregnant women, as a result we compared previous incidence in pregnant women with the most prevalence risk factors in West Libya as owning of cats or dogs, dealing with soil, wearing of gloves while handling meat, consumption of milk and source of water. The study shows 3.70% of the respondents that previously aborted owned cat or dogs in their home. Also revealed 40.7% of them were dealing with soil and all previously aborted respondents were not using gloves while handling meat. Comparison between previous abortion incidences and consumption of milk showed that 70.4% of aborted women have consumed milk daily, and regarding water sources 55.6% of aborted respondents have consumed treated water and 18.5% of them consumed wells or taps water.

Conclusion

The risk factor which included in this study suggest that women (pregnant and non-pregnant) may be at risk if they are not educated about toxoplasmosis to reduce and prevent *T. gondii* transmission. They require knowledge about *T. gondii* infection and its mechanism of transmission.

More investigations such as estimation of the seroprevalence of toxoplasmosis in pregnant women for the presence of anti-*Toxoplasma* IgG and anti-*Toxoplasma* IgM

antibodies using ELISA test to determine the occurrence of toxoplasmosis in women are needed.

Furthermore, learning programmes for risk groups such as pregnant mothers and immunodeficient patients should be formed.

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