Polytechnic Journal

Polytechnic Journal

Volume 7 | Issue 3 Article 3

8-1-2017

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How to Cite This Article

Abdullah, Hussein M. Mr. and Mahmood, Marwan A. Mr. (2017) "Seroprevalence of Toxoplasma gondii among Pregnant Women in Erbil City/ Kurdistan Region/ Iraq," *Polytechnic Journal*: Vol. 7: Iss. 3, Article 3. DOI: https://doi.org/10.25156/ptj.2017.7.3.47

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Abstract

Objectives: Toxoplasma gondii is an intracellular parasite that infects one third of world population. Toxoplasmosis is an important especially in pregnant women and immunocompromised patients, the pregnant women infection would be life threatening or remain severe disorders for the fetus. The aim of this study was to determine the seroprevalence of the parasite antibodies in pregnant women attending maternity and Pediatric Hospital in Erbil city. Methods: Serum samples were collected from pregnant women then anti-Toxoplasma IgG and IgM antibodies were estimated by commercially ELISA kits and the relation of infection with socio- demographic factors such as age, residency, educational levels and gestational age were studied. Results: Two hundred sixty-three serum samples were tested, 92/263 (34.8%) of them had IgG antibodies and 34/263 (12.93%) were positive for IgM antibodies against Toxoplasma gondii. The seropositivity was more prevalent among (21-30years) age group for both IgG and IgM; 55/118(46.61%), 20/63(16.44%) respectively. A significant correlation was observed between infections with residency. Education and gestational age were not significantly associated with the infection among pregnant women. Conclusion: The present study indicates that the prevalence of toxoplasmosis is comparatively high in pregnant women in Erbil city. Thus, the serological screening for anti-Toxoplasma antibodies is necessary to reduce the risk of congenital transmission.

Keywords

Toxoplasma gondii, ELISA, pregnant women, Seroprevalence

Polytechnic Journal: Vol.7 No.3 (June 2017): Pp:54-63
http://epu.edu.krd/ojs/index.php/Journal

DOI: https://doi.org/10.25156/ptj.2017.7.3.47

Seroprevalence of *Toxoplasma gondii* among Pregnant Women in Erbil City/ Kurdistan Region/ Iraq

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ABSTRACT

Objectives: Toxoplasma gondii is an intracellular parasite that infects one third of world population. Toxoplasmosis is an important especially in pregnant women and immunocompromised patients, the pregnant women infection would be life threatening or remain severe disorders for the fetus. The aim of this study was to determine the seroprevalence of the parasite antibodies in pregnant women attending maternity and Pediatric Hospital in Erbil city.

Methods: Serum samples were collected from pregnant women then anti-Toxoplasma IgG and IgM antibodies were estimated by commercially ELISA kits and the relation of infection with socio-demographic factors such as age, residency, educational levels and gestational age were studied.

Results: Two hundred sixty-three serum samples were tested, 92/263 (34.8%) of them had IgG antibodies and 34/263 (12.93%) were positive for IgM antibodies against Toxoplasma gondii. The seropositivity was more prevalent among (21-30years) age group for both IgG and IgM; 55/118(46.61%), 20/63(16.44%) respectively. A significant correlation was observed between infections with residency. Education and gestational age were not significantly associated with the infection among pregnant women.

Conclusion: The present study indicates that the prevalence of toxoplasmosis is comparatively high in pregnant women in Erbil city. Thus, the serological screening for anti-Toxoplasma antibodies is necessary to reduce the risk of congenital transmission.

Key words: ***Toxoplasma gondii, ELISA, pregnant women, Seroprevalence.***

INTRDUCTION

Toxoplasmosis is a worldwide infection caused by the intracellular parasite Toxoplasma gondii. At least a third of the world populations are infected with this parasite [1]. The exposure to the parasite occurs by eating undercooked meat, drinking water or eating vegetables contaminated with cat feces

[2]. Primary infection is usually subclinical in approximately 90% [6], but in severely immunocompromised patients it may be life threatening [3, 4].

There are several factors affecting the prevalence of toxoplasmosis like contact with cats, nutritional habits, age and residency [7].

Toxoplasmosis has a great public health importance in pregnant women as it can lead to transplasental transmission and involvement of the fetus with pathological effects including chorioretinites, intracranial calcification, hydrocephalus, and even stillbirth [5, 8 and 9]. The rate of this route of infection is between 17-25% when there is maternal during the first and second trimester and 65% when infection occurs during the third trimester from pregnant women [10], thus the early diagnosis is a crucial step to start treatment on time to minimize the transplasental transmission [1,9].

Toxoplasmosis can be diagnosed serologically in pregnant women by several tests that depend on the demonstration of anti-Toxoplasma antibodies i.e. IgG, IgM, IgA, and IgE in body fluids, mainly serum [1].

Studies indicate that prevalence of Toxoplasma gondii infection in pregnant women varies among countries, for example in European countries, prevalence varies from 9 to 67% [11]. In southern Turkey anti-Toxoplasma IgG and IgM was found to be 52.1% and 0.54% respectively [12], while in the western region in the same country the Seroprevalence of IgG and IgM antibodies was found to be 48% and 0,4% respectively [13]. In Iran 39.8% were positive for IgG and 3.4% had IgM antibodies [14]. In Egypt 52.2% for IgG and 9.7% were positive for IgM [15]. In Baghdad/Iraq high prevalence 75% of Toxoplasma infection was recorded in pregnant women [16]. In Kirkuk the total seropositivity was found 36.65% [39]. In Erbil 45.2% of anti-Toxoplasma was recorded [17].

The present study was aimed to investigate the seroprevalence of Toxoplasma gondii among pregnant women in Erbil city by ELISA, which is more sensitive and specific, and discuss some factors associated with infection.

MATERIALS AND METHODS

Blood samples were collected from 263 pregnant women referred to Erbil Teaching Maternity Hospital for the period from December 2015 to April 2016 to detect Toxoplasma gondii antibodies. A single sample from each pregnant woman was collected in 5ml tubes and sera separated by blood centrifugation at 3000 rpm for 5 min then stored at 4°C. The anti-Toxoplasma gondii IgG and IgM antibodies were tested by commercial ELISA kit (Diagnostic Automation, Inc.) which has been done according to manufactured company instruction.

A questionnaire sheet was prepared for each woman containing age, residency, education, and gestational age.

Collected data analyzed by using Statistical Package for Social Science (SPSS) version (23) software. The correlation between selected variables and seropositivity was analyzed by Chi-square test. The differences were considered to be statistical significant when the P. value was less than 0.05.

RESULTS

Two hundred sixty-three pregnant women were tested for toxoplasmosis Seroprevalence (IgG and IgM). All samples were from Erbil and its outskirts, 92/263(34.98%) were positive for anti-Toxoplasma gondii IgG and 34/263(12.93) were positive for IgM, and overall prevalence of both antibodies were positive in 126/263(47.91%) as shown in table (1).

Table (1): Prevalence of anti-Toxoplasma gondii IgG and IgM

***Toxoplasma* antibodies**	**No. tested**	**No. positive**	**Percentage (%)**
IgG	263	92	34.98
IgM	263	34	12.93
Total	263	126	47.91

According to the age groups, the highest seropositivity of both anti-Toxoplasma IgG and IgM found in the age group 21-30 years, 55/118(46.61%), 20/118(16.94%) respectively, and the lowest rate of infection respecting both IgG and IgM were in the age group <20 years 4/31(12.96%), 3/31(6.45%) respectively. Statistically the differences regarding to the IgG with age groups was significant (P<0.05) but with IgM was not (P>0.05). Table (2).

Table (2): Prevalence of anti-Toxoplasma gondii IgG and IgM among different age groups of pregnant women

Age (years)	**No. tested**	**IgG**		**IgM**	
		No. Positive (%)		**No. Positive (%)**	
<20	31	4(12.96)	**P=0.0013 P<0.05**	**3 (6.45)**	**P=0.3061 P>0.05**
21-30	118	55(46.61)		**20 (16.94)**	
31-40	87	24(27.58)		**9 (10.34)**	
>40	27	9(33.33)		**2 (7.40)**	

Respecting the residency, significantly higher seropositivity of anti-Toxoplasma IgG and IgM found in rural dwellers 38/86(44.18%), 18/86(30.5%), than those in urban areas 54/177(30.5), 16/177(9.03%) respectively. Table (3).

Table (3): Prevalence of anti-Toxoplasma gondii IgG and IgM according the residency in pregnant women.

Residency	**No. tested**	**IgG Positive (%)**	**P=0.0291 P<0.05**	**IgM Positive (%)**	**P=0.007 P<0.05**
Rural	86	38(44.18)		18(20.93)	
Urban	177	54(30.5)		16(9.03)	

The distribution of seroprevalence of toxoplasmosis in relation to education levels for both anti-Toxoplasma IgG and IgM the higher infection was observed in basic class 7-9 group 25/61(40.98%),

11/61(18.03%) respectively, but statistically the differences between all groups were not significant (p>0.05). Table (4).

Table (4): Prevalence of anti-Toxoplasma gondii IgG and IgM according to the education level in pregnant women

Education level	No. tested	IgG positive (%)		IgM positive (%)	
Illiterate	56	17(30.35)	**P=0.753 P>0.05**	5(8.92)	**P=0.681 P>0.05**
Basic (1-6)	71	26(36.62)		9(12.67)	
Basic (7-9)	61	25(40.98)		11(18.03)	
Preparatory	48	15(31.25)		6(12.5)	
University	27	9(33.33)		3(11.11)	

As shown in the table (5), the highest Seroprevalence of anti-Toxoplasma gondii IgG was found in the second trimester 32/74(43.24%), while anti-Toxoplasma gondii IgM was observed at highest level in the first trimester 22/151(14.56%). Statistically no significant differences showed in the distribution of both antibodies. P> 0.05.

Table (5): Prevalence of anti-Toxoplasma gondii IgG and IgM according to the gestational age in pregnant women.

Gestational age	No. tested	IgG positive (%)		IgM positive (%)	
First trimester	151	52(34.44%)	**P=0.0645 P>0.05**	22(14.56%)	**P=0.808 P>0.05**
Second trimester	74	32(43.24%)		9(12.16%)	
Third trimester	38	8(21.05%)		3(7.89%)	

DISCUSSION

This study demonstrated a Seroprevalence for IgG (chronic infection) and IgM (recently acquired infection) antibodies 34.98% and 12.93%, respectively against T. gondii in pregnant women in Erbil city, the total seropositivity of both antibodies was 47.91%. Table (1).

The seropositive of anti-T. gondii antibody recorded in this study was in agreement with a previous study was conducted by Khoshnaw in Erbil who reported 45.2% overall seropositive in pregnant women, and 12.5% anti-T. gondii IgM in the same group [17], and agreed with that reported in Sana'a, Yemen 11.88% for IgM [28]. The present results are closer to that reported in Jordan 47.15% [18], in Egypt 50.8% [9] and in Brazil 47.8-53.4% [19]. The findings of this study were lower than those found in Aden, Yemen 62% for IgG [20] and our total result is much lower than that observed in south eastern Anatolia, Turkey 69.5% [21]. In contrast our results were higher than those conducted for IgG and IgM in salah-Adden governorate, Iraq 26.1% and 3.1% respectively [22], in Makkah, Saudi Arabia 29.4% and 3.1% [23] and in India 9.9% and 3.9% [5].

The variability of the results of the present study with others could be by; age distribution of sample population, environmental conditions of each area which are important for oocysts maturation and survival, habits of meat consumption, level of natural immunity and contact with cats [17 and 25].

Regarding the age groups our study showed that both anti-T. gondii IgG and IgM in the age group 21-30 years higher than others 46.61%, 16.94% respectively, Table (2). The differences were significant respecting to IgG ($p<0.05$), but with IgM were not. That was in concordance with results of some previous studies; in Iran [14], in Saudi- Arabia [26], and in Duhok/Iraq [27]. In contrast some studies reported that the Seroprevalence of Toxoplasma antibodies increased with age, they observed high percentage of infection in women who were more than 40 years old [23, 28, and 29]. The suspected reason may be due to the unequal degree of exposing to oocysts of T. gondii among the various age groups.

In relation to the residence frequency of seropositivity of both IgG and IgM in rural dwellers pregnant women were 44.18%, 20.93% respectively, the differences were significantly higher than those from urban districts who showed 30.5%, 9.03% respectively. Table (3) some other studies also described that the seropositivity of both antibodies were significantly higher in rural populations than urban areas in different countries [5, 18, 20, 30 and 34], while different studies in other countries were found no statistical differences of seropositivity between these two populations [4, 14, 31, 32 and 33]. These variations could be attributed to that rural populations had lower socio-economic levels than urban ones and implementation of more hygienic lifestyle in towns and large cities [17]. Therefore, lack of potable water and consumption of well or spring water may increase the infection risk in the rural communities [31].

As Table (4) Shows the seropositivity of both IgG and IgM according to education levels, our findings revealed no statistical differences ($P>0.05$) among participant pregnant women. Such results were in accordance with those obtained by [4, 17, 23 and 33], while some studies in different countries were observed that the infection is more prevalent among illiterate women [9 and 20]. The absence of statistical differences of toxoplasmosis among pregnant women and educational levels does not indicate that this factor has no an effect on the reducing of infection in educated women [7].

The prevalence of anti-T. gondii IgG and IgM antibodies found in this study demonstrated no significant differences between gestational age (trimesters) of the fetus and seropositivity ($P>0.05$) of both antibodies. Table (5). Our results were agreed with those reported by [4, 5, 14, 17, 35 and 36], these results reflect that all stages of pregnancy have the same chance of requiring infection; otherwise the findings of this study were in contrast to that observed by others who found different high seropositivity in different gestational ages [23, 37 and 38]. These variations might be due to changes in levels of pregnancy associated hormones during trimesters of pregnancy [4].

CONCLUSION

Our study revealed that the total seroprevalence of T. gondii antibodies is comparatively high among pregnant women (47.91%) in Erbil province, and the age group 21-30 year showed significant chronic infection(46.61%), women from rural area were significantly more exposed to infection than those from urban area, and the trimesters of gestation didn't show differences for infection.

RECOMMENDATION

It is recommended that implementation of regular serological testing before and during pregnancy is needed to reduce the effects of toxoplasmosis on mothers as well as newborns and the guidance of women is necessary about the riskiness and risk factors of toxoplasmosis.

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77. الانتشار المصلي للمقوسة الكوندية في النساء الحوامل في مدينة اربيل / اقليم كوردستان / العراق

78.

الخلاصة

الهدف: المقوسة الكوندية هي طفيلى داخل خلوى التى تصيب ثلث سكان العالم, المرض ذات اهمية خصوصا في النساء الحوامل والمرضى الذين لديهم نقص المناعة.

اصابة النساء الحوامل بالطفيلي تبقى خطرا على حياة الجنين أو تنتج امراض خطيرة لديم, تهدف هذه الدراسة الى تحديد انتشار المصلى لاضداد هذا الطفيلي في النساء الحوامل اللواتي زرن مستشفى الولادة في مدينة اربيل.

الطرق: جمع نماذج المصل من نساء الحوامل وتم تحديد الاضداد IgG و IgM بواسطة الكيتات المتوفرة ل ELISA وتم دراسة الاصابة بعوامل الاجتماعية/السكانية مثل العمر, موقع الاقامة, المستوى التعليمي ومراحل الحمل.

النتائج: اضهرت نتائج الدراسة بان من مجموع 263 نموذج مصل 263/92 (34.8٪) كانت موجبة للضد IgG و 263/34 (12.93٪) كانت موجبة ل IgM للاصابة بالمقوسة الكوندية, الانتشار المصلي, ومجموع الاصابات كانت 263/126 (47.91٪) لكلى الضدين.

الانتشار المصلي للمقوسة الكوندية كانت اعلى في الفئة العمرية (30-21 سنة) حيث كانت 118/55 (46.61٪) و 63/20 (16.44٪) لل IgG و IgM على التوالي. وكانت العلاقة معنوية بالنسبة للاصابات حسب موقع الاقامة, ولم تعطي المستوى الثقافي للحوامل وفترة الحمل أي علاقة معنوية للاصابة بين النساء الحوامل.

الاستنتاج: اظهرت الدراسة بأن انتشار مرض المقوسة الكوندية نسبيا عالية بين نساء الحوامل في مدينة اربيل, لذا الفحص المصلي أثناء الحمل ضرورية لتقليل الاصابة.

بلاوبونەوەی سیرۆلۆجی توکسوثلازما طوندی لە ئافرەتی سکثرِ لە شاری هەولیَر / هەریَمی کوردستان / عیَراق

ثوختة

ئامانج: توکسوثلازماطوندی مشەخۆریکی ناوخانەکانە کە سیَ یەکی دانیشتوانی جیهان توش دەکات. نەخۆشیەکە طرنطة لة ئافرەتی سك ثرِ و ئەو نەخۆشانەی کة بەرطریان کەمة.

توش بوون بەم مشەخۆرة بۆ ئافرەتی سك ثرِ ترسناك دەبیَت بۆ کۆرثەلّة لەسەر ذیانیان و توشبوونیان بەنەخۆشی ترسناك. ئەم توَذینەوەیة ئامانجی ئەوەیة کة بلاوبوونەوەی دذەتەنی ئەم مشەخۆرة دیاری بکات لة ئافرەتانی سك ثرِ ئەوانەی سەردانی نەخۆشخانەی لەدایکبوونیان کردووة لة شاری هەولیَر.

ریَطاکان: نموونەی سیرەم لەئافرەتانی سك ثرِ وەرطیراو هەردوو دذەتەنی IgG و IgM دیاری کرا بەهۆی کیتی بەردەست لة ELISA و هەروەها ثەیوەندی توشبوون بەهەندیَك هۆکاری سوسیۆ-دیمۆطرافی وەك تەمەن, شویَنی دانیشتن, ئاستی فیَربوون و قۆناغەکانی سکثرِی لیکدرایةوة.

ئەنجامەکان: ئەنجامەکان دەریانخست کة لەکۆی 263 نموونة 263/92 (34.8٪) ثۆزەتیظ بوو بۆ IgG و 263/34 (12.93٪) ثۆزەتیظ بوو بۆ IgM بۆ توکسوثلازماطوندی. کۆی طشتی توشبووانیش 263/126 (47.91٪) بوو.

توشبوون بة توکسوثلازماطوندی زیاتر بلاوة لة تەمەنی (30-21 سالَ) بەشیوەیەك 118/55 (46.61٪) 63/20 (16.44٪) بۆ IgG و IgM یەك بەدوای یەك, ثەیوەندیەکی مانادار بوو لەنیَوان توشبووان بەثیَ ی شویَنی دانیشتن و هیض ثەیوەندیەکی مانادار تیَبینی نەکرا بەطویَرەی ئاستی فیَربوون و ماوەی سکثرِی لەناو ئافرەتة سکثرِەکاندا.

دەرئەنجام: ئەم توَیذینەوەیة دەریخست کة بلاوبوونەوەی توکسوثلازماطوندی ریَذەیەکی بەرزی هەیة لەناو ئافرەتی سکثرِ لەشاری هەولیَر. بۆیة ثشکنین لەکاتی سکثرِیدا ثیَویستة بۆ کەمکردنەوەی توشبوون بەم مشەخۆرة.