

## Seroprevalence of *Toxoplasma gondii* among pregnant women visiting maternity hospital in Hail, KSA

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**Abstract:** *Toxoplasma gondii* is an intracellular parasite of warm-blooded animals that causes one of the most common parasitic infections in humans. It is endemic worldwide and 15 to 85% of the human populations are asymptotically infected. Here, the aim of this study is to determine the prevalence of toxoplasma antibodies in pregnant women in Hail city, KSA. In 2013, 6076 pregnant women were examined for IgG and IgM antibodies using ELISA technique. The age range was 19-43 years. The overall IgG seroprevalence was 9.8% and IgM seroprevalence was 0.6%. The IgM is indicative of low recent exposure to the parasite. In conclusion, the overall seroprevalence indicates a very low percentage in pregnant women living in Hail, KSA. This lowers the risk of contracting *T. gondii* infections which minimize the risk of congenital toxoplasmosis.

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### 1. Introduction:

*Toxoplasma gondii* is an intracellular parasite with very low host specificity and will probably infect almost all mammal and birds (Tener *et al.*, 2000). It is endemic worldwide and 15 to 85% of the humans are asymptotically infected. Most cases of human infection are mild, but devastating disease can occur in immune compromised individuals and congenitally infected fetuses in which serious neurological or ocular problems that appear either early after labour or later on during life and may not become manifested until the second or third decade of life. The progression and severity of the disease differ in patients due to several variables, including host, effectiveness of the immune system and parasite genetics (Carmen *et al.*, 2006 and Flegr *et al.*, 2013).

Seroprevalence estimates vary greatly among different countries, among different geographical areas within one country, and among different ethnic groups living in the same area. Over the past three decades antibodies to *T. gondii* have been detected in individuals in various adult human populations from 18 to 100% (Tener *et al.*, 2000). A prevalence of 100% has been reported from Saudi women (El-Sebai, 1991), 71% in French women (Jeannel *et al.*, 1988), 22.5% in the United States (Jones *et al.*, 2003), 11% in Norway (Jenum *et al.*, 1998) and decreasing prevalence has been reported in Swedish women, 34% in 1969 and 18% in 1987 (Forsgren *et al.*, 1991). Regional variations have been attributed to climate, cultural differences in the amount and type of raw meat consumed and the variable consumption of meat

from animals farmed indoors and frozen meat (Carmen *et al.*, 2006).

The aim of this study is to find out how many pregnant women in Hail region infected with toxoplasma through examination of serum sample using ELISA technique for *Toxoplasma* IgG and IgM, with trying to find out the number of abortion cases due to this parasite.

### 2. Material and Methods:

#### Samples collection:

From January to December 2013, 6076 blood samples were collected from women visiting Hail Maternity Hospital and dispensaries in the first few months of pregnancy. Serum was tested for toxoplasmosis by using ELISA to prospectively monitor serological levels of IgG and IgM antibodies.

About 4mL of venous blood samples was collected by venepuncture in a plain labeled test tube then stored at 4°C. These sera were then separated and kept at -20°C. prior to analysis, samples were thawed and brought to room temperature.

#### Specimen analysis:

All specimen and kit reagents were brought to room temperature (23-25°C) and gently mixed before used. Examination of specimen was performed using two kits:

1- *Toxoplasma* IgG ELISA by United Diagnostic Industry (UDI)

The UDIEG127 *Toxoplasma* IgG test system is an Enzyme Linked Immunosorbent Assay kit providing material for the detection of IgG-class antibodies to *Toxoplasma gondii* parasite in human serum or plasma.

2- Toxoplasma IgM ELISA by United Diagnostic Industry (UDI)

The UDI EM127 Toxoplasma IgM ELISA is an Enzyme Linked Immunosorbent Assay kit providing material for detection of IgM –class antibodies to *T. gondii* in human serum or plasma. Results were obtained following the Manufacturer's SOP (standard operation protocol).

3. Results:

A total of 6076 pregnant women were investigated for toxoplasma antibodies from April to December 2013 (Table 1). Only 595 women (9.8%) were found positive for Toxoplasma IgG, and 35 (0.58%) pregnant women were positive for Toxoplasma IgM (Figure 1).

Table 1: Seroprevalence of Toxoplasma IgG and IgM in Hail, KSA:

Month	Number of samples	IgG positive	IgM positive	Age (range)
April	168	10	4	30- 43
May	728	33	1	19- 38
June	998	60	15	23-37
July	670	30	11	23-31
August	750	33	1	26-39
September	643	46	0	25-42
October	496	11	0	20-29
November	1162	33	3	unknown
December	461	339	0	24- 40
TOTAL	6076	595	35	19-43

Percentage of IgG and IgM positive samples

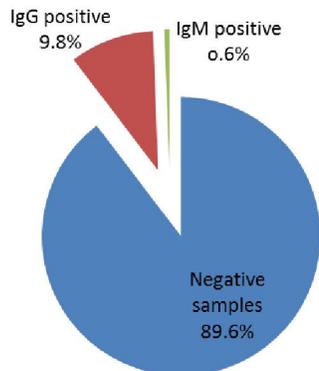


Figure 1: Percentage of IgG and IgM seropositive pregnant women (out of 6076 women).

Number of IgG and IgM positive cases investigated in the Regional Lab- Hail, KSA

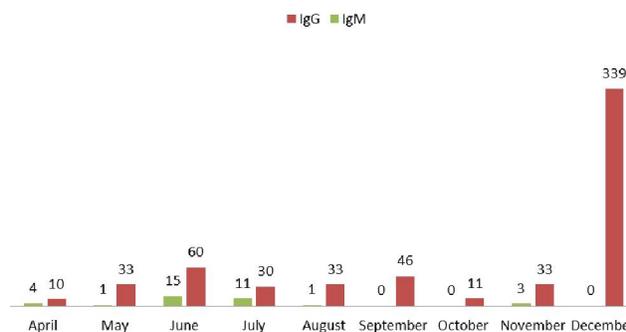


Figure 2: Number of seropositive pregnant women from April to December 2013.

4. Discussion:

The most serious form of *Toxoplasma* infection is Congenital *Toxoplasmosis* which is accompanied by serious foetal complication based on gestational age at the time of infection. Since the 1960s many studies investigating the percentage of women infected had been done in France and the US (Table 2 and Figure 2). There was a decline in seropositivity when comparing the percentage of the old and recent ones.

In this study, out of the 6076 pregnant women, 595 women (9.8%) were positive for *Toxoplasma* – IgG and 35 (0.58%) pregnant women were positive for *Toxoplasma*–IgM. The percentage of pregnant women exposed to *Toxoplasmosis* is low compared with that reported world wide, this means that of pregnant women are infected by *Toxoplasma* parasite recently differ with that reported by in Nigeria were seroprevalence of 32.6% (Deji *et al.*, 2011) obtained in this study for *Toxoplasma gondii* IgG and reported from Northern part of Nigeria, where an IgG seroprevalence of 29.1% was obtained among pregnant women (Ishaku *et al.*, 2009).

In Qatar a seroprevalence of 35.1% was found among women of child-bearing age (Abu-Madi *et al.*, 2010), also in Trinidad and Tobago a seroprevalence of 39.3% was detected among expectant mother (Ramsewak *et al.*, 2008). However, other studies reported higher rates than our findings of this study, in Makkah-KSA, the seroprevalence of anti-*Toxoplasma* IgG was 29.4% whereas IgM seropositive was 5.6% (Al-Harathi *et al.*, 2006). Also the seroprevalence in this study was low compared to studies in Brazil (Vaz *et al.*, 2010) Al Hasa-KSA (Mohammad *et al.*, 2010) Morocco (El-Mansouri *et*

al., 2007) and Sudan (Elnahas *et al.*, 2003). This may be accounted for by differences in climatic conditions, as reported before, where higher seroprevalence is associated with hotter and wetter areas, which is favourable for sporulation of oocysts compared to less humid areas (Nijem, 2009; and Kistiah *et al.*, 2011).

An increase in sero-positivity of anti-*T. gondii* antibodies was observed with increasing age in this study, which is consistent with other studies (Rosso, 2008; and Zemene *et al.*, 2012). The observed risk increase per year might be considered high and may reflect higher infection risks at early adolescence.

This study has shown that the seroprevalence of *Toxoplasma* IgG which constitutes 9.8% of the total samples 6076, which indicates that the 9.8% of pregnant women have an old infection higher than for *Toxoplasma* -IgM, this means that 0.58% of pregnant women are infected by *Toxoplasma* parasite recently.

There is the need to include the testing of *Toxoplasma* as a part of the antenatal investigation and educate pregnant women on the risk factors associated with *Toxoplasma* infection.

The most serious form of *Toxoplasma* infection is Congenital *Toxoplasmosis* which is accompanied by serious foetal complication based on gestational age at the time of infection.

Table 2: Prevalence of *T. gondii* IgG in different geographical localities.

Country (City)	Year	IgG Seopositivity (%)	Reference	
Geneva, Switzerland	1973	87	Henri <i>et al.</i> , 1992	
	1987	47		
Paris, France	1965	86	Ancelle <i>et al.</i> , 1996	
	1995	54		
South Yorkshire, UK	1969	44	Ades and Nokes, 1993.	
	1990	8		
Stockholm, Sweden	1969	34	Nokes <i>et al.</i> , 1993	
	1987	18		
Northern Region, Greece	1984	37	Diza <i>et al.</i> , 2005.	
	2004	24		
Lodz, Poland	1998	45.5	Nowakowska <i>et al.</i> , 2006.	
	2003	39.4		
Palo Alto, USA	1970	24	Remington <i>et al.</i> , 2006	
	2003	9		
US recruits	1965	14.4	Smith <i>et al.</i> , 1996	
	1989	9.5		
Central Valley region, Costa Rica	1980	70	Zapata <i>et al.</i> , 2005	
	2003	58		
Nigeria	Lagos	2011	32.6	Deji <i>et al.</i> , 2011
	Zaria	2009	29.1	Ishaku <i>et al.</i> , 2009
Qatar	2010	35.1	Abu-Madi <i>et al.</i> , 2010	
Trinidad and Tobago	208	39.3	Ramsewak <i>et al.</i> , 2008	
Kingdom of Saudi Arabia (KSA)	Makkah	2006	29.4	Al-Harhi <i>et al.</i> , 2006
	Al Ahasa	2010	51.4	Mohammad <i>et al.</i> , 2010
	Hail	2014	9.8	Present study
Brazil	Southern Brazil	2010	53.0	Vaz <i>et al.</i> , 2010
Morocco	Rabat	2007	50.6	El-Mansouri <i>et al.</i> , 2007
Sudan	Khartoum and Omdurman	2003	65	El nahas <i>et al.</i> , 2003

### Conclusion:

Seroprevalence of *Toxoplasma gondii*-specific antibodies IgG among pregnant women in Hail, which constitutes 9.8% of the total samples 6076. This indicates an old infection compared with new exposure observed by *Toxoplasma* -IgM. An increase in sero-positivity of anti-*T. gondii* antibodies was observed with increasing age. Adequate data were not

available on exposure to feral cats, how well meat is cooked, or exposure to contaminated water.

### References:

1. Abu-Madi, M.A., Al-Molawi, N., Behnke, J.M. 2008. Seroprevalence and epidemiological correlates of *Toxoplasma gondii* infections among patients referred for hospital-based

- serological testing in Doha, Qatar. *Parasites & Vectors*, 1:39.
2. Ades AE, Nokes DJ, 1993. Modeling age and time specific incidence from seroprevalence: Toxoplasmosis. *Am J Epidemiol* 137: 1022–1034.
  3. Al-Harathi, S.A.; Jamjoom, M.B. and Ghazi, H.O. (2006) Seroprevalence of *Toxoplasma Gondii* Among Pregnant Women in Makkah, Saudi Arabia. *Um Al-Qura Univ. J. Science Med. Eng.*, 18: 217-227.
  4. Ancelle T, Goulet V, Tirard-Fleury V, Baril L, Mazaubrun C, Thulliez Ph, Weislo M, Carme B, 1996. La toxoplasmosis chez la femme enceinte en France en 1995. *Bull EpidemiolHebdom Direct Gen* 51: 227–228.
  5. Astrid M. Tenter, Anja R. Heckerroth, and Louis M. Weiss 2000. *Toxoplasma gondii*: from animals to humans. *Int. J. Parasitol.*; 31: 217.
  6. Carmen Studeničová a, Gabriela Benčaiová, b and Renata Holková-Seroprevalence of *Toxoplasma gondii* antibodies in a healthy population from Slovakia. *European Journal of Internal Medicine* 17 (2006) 470–473
  7. Deji- A. M ,Agboola, O. S. Busari, O. A. Osinupebi, A O. J. Amoo. Seroprevalence of *Toxoplasma gondii* Antibodies among Pregnant Women Attending Antenatal Clinic of Federal Medical Center, Lagos, Nigeria. *International Journal of Biological Medical Research* 2, 1135–1139.
  8. Diza E, Frantzidou F, Souliou E, Arvanitidou M, Gioula G, Antoniadis A, 2005. Seroprevalence of *Toxoplasma gondii* in northern Greece during the last 20 years. *ClinMicrobiol Infect* 11: 719–723.
  9. El-Sebai MM (1991): Study on toxoplasmosis in Quasseem, Saudi Arabia. *Egypt. Soc. Parasitol.*, 21 (1):273-275.
  10. El-Mansouri BRM, Sebti F, Amarir F, Laboudi M, Bchitou R, Hamad M, Lyagoubi M (2007): Seroprevalence of toxoplasmosis in pregnant women in Rabat, Morocco. *Bull SocPathol Exot*, 100:289-90.
  11. Elnahas AGA, Elbashir MI, Eldien ES, Adam I: Toxoplasmosis in pregnant Sudanese women (2003). *Emerg Infect Dis*; 9(11): 1371-4.
  12. Flegr J., Preiss, M., Klose, J.2013: Toxoplasmosis-associated difference in intelligence and personality in men depends on their Rhesus blood group but not ABO blood group. *PLoS ONE*, 8(4): e61272.
  13. Forsgren M, Gille E, Ljungstrom I, Nokes DJ. *Toxoplasma gondii* antibodies in pregnant women in Stockholm in 1969, 1979, and 1987. *Lancet* 1991;337(8754):1413-4.
  14. Henri T, Jacques S, Rene L, 1992. Twenty-two years screening for toxoplasmosis in pregnancy: Liege, Belgium. *Scand J Infect Dis* 84 (Suppl): 84–85.
  15. Ishaku BS, Ajogi I, Umoh JU, Lawal I, Randawa AJ, 2009. Seroprevalence and Risk Factors for *Toxoplasma Gondii* Infection among Antenatal Women in Zaria, Nigeria. *Res. J. of Medicine and Medical Sciences*, 4(2):483-8.
  16. Jeannel D, Neil G, Costagliola D, Danis M, Traore BM, Gentillini M 1988. Epidemiology of toxoplasmosis among pregnant women in the Paris area. *Int. J. Epidemiol.* 17: 595-602.
  17. Jenum PA, Kapperud G, Stray-Pedersen B, Melby KK, Eskild A, Eng J 1998. Prevalence of *Toxoplasma gondii* specific immunoglobulin G antibodies among pregnant women in Norway. *Epidemiol Infect*;120(1):87-92.
  18. Jones JL, Kruszon-Moran D, Wilson M, 2003. *Toxoplasma gondii*infection in the United States, 1999-2000. *Emerg Infect Dis* 9: 1371-4.
  19. Jones, J, Lopez, A, and Wilson, M. (2003). Congenital toxoplasmosis. *American Family Physician*, 67(10): 2131-8
  20. Kistiah KBA, Winiecka-Krusnell J, Karstaedt A, Freaun J: Seroprevalence of *Toxoplasma gondii* infection in HIV-positive and HIV-negative subjects in Gauteng, South Africa. *South Afr J Epidemiol Infect* 2011, 26(4): 22.
  21. Mohammad HIAT, Balaha MH, Moghannum MS 2010. Toxoplasmosis among the pregnant women attending a Saudi maternity hospital: seroprevalence and possible risk factors. *Ann Trop Med parasitol*,104: 493-504.
  22. Nijem KA-AS 2009: Seroprevalence and associated risk factors of toxoplasmosis in pregnant women in Hebron district, Palestine. *East Med Health J* 15: 1279-1284.
  23. Nokes DJ, Forsgren M, Gille E, Ljungstrom I, 1993. Modelling toxoplasma incidence from longitudinal seroprevalence in Stockholm, Sweden. *Parasitology* 107: 33–40.
  24. Nowakowska D, Stray-Pedersen B, Spiewak E, Sobala W, Matafiej E, 2006. Wilczynski. Prevalence and estimated incidence of *Toxoplasma* infection among pregnant women in Poland: a decreasing trend in the younger population. *Clin Microbiol Infect* 12: 913-7.
  25. pregnant women in Trinidad and Tobago. *Rev Panam Salud Publica*. 2008;
  26. Ramsewak S, Gooding R, Ganta K, Seepersadsingh N, and Adesiyun AA. 2008. *Toxoplasma gondii* infection amongpregnant women in Trinidad and Tobago. *Pan Am J Public Health* 23(3): 164-70.

27. Remington JS, McLeod R, Thulliez P, Desmonts G, 2006. Toxoplasmosis. Chapter 31. In: JS Remington and J Klein, eds. *Infectious Diseases of the Fetus and Newborn Infant* (6th ed.). WB Saunders, Philadelphia, 947–1092.
28. Rosso F. (2008): Prevalence of infection with *Toxoplasma gondii* among pregnant women in Cali, Columbia, South America. *Am J Trop Med Hyg* 2008, 78:504-8.
29. Saeed A. Al-Harathi; Manal B. Jamjoom; Hani O. Ghazi (2006): Seroprevalence of *Toxoplasma gondii* Among Pregnant Women in Makkah, Saudi Arabia. Umm Al-Qura Univ. J. Sci. Med. Eng. Vol. 18, No.2, pp.217 -227.
30. Smith KL, Wilson M, Hightower AW, Kelley PW, Struewing JP, Juranek DD, McAuley J, 1996. Prevalence of *Toxoplasma gondii* antibodies in US military recruits in 1989: comparison with data published in 1965. *Clin Infect Dis* 23: 1182–1183.
31. Tenter AM, Heckeroth AR, Weiss LM. *Toxoplasma gondii*: from the Paris area. *Int. J. Epidemiol.*, 17: 595-602.
32. Vaz, R.S., Thomaz-Soccol, V., Sumikawa, E., Guimarães, A.T.B. 2010. Serological prevalence of *Toxoplasma gondii* antibodies in pregnant women from Southern Brazil. *Parasitology Research* 106: 661–665.
33. Zapata M, Reyes L, Holst I, 2005. Disminución en la prevalencia de anticuerpos contra *toxoplasma gondii* en adultos del valle central de Costa Rica. *Parasitol Latinoam* 60: 32–37.
34. Zaria, Nigeria. *Res. J. Medicine & Med. Sci.* 2009; 4(2): 483-488.
35. Zemene E, Yewhalaw D, Abera S, Belay T, Samuel A, Zeynudin A (2012). Seroprevalence of *Toxoplasma gondii* and associated risk factors among pregnant women in Jimma town, Southwestern Ethiopia. *Ann Trop Med Parasitol* 2010, 104:493-504 *BMC Infect Dis* 2012, 12:337.

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