

Toxoplasmosis and Associated Risk Factors in Antenatal Clinic follow up Pregnant Women in Selected Health Institutes of Jigjiga, East Ethiopia

Abstract

Toxoplasma gondii infections in pregnancy lead devastating effects including blindness, neurological impairment and mental retardation in congenitally infected children. Despite such adverse effects caused by this parasite, data on morbidities and associated risk factors among pregnant women in Jigjiga, Ethiopia is scarce. Thus, the aim of this study was to determine the seroprevalence of *Toxoplasma gondii* infections and associated factors among pregnant women attending antenatal care in public health institutes of Jigjiga, East Ethiopia. A cross-sectional study was undertaken from September, 2013 to January, 2013. Three hundred and one pregnant women attending antenatal clinic were screened for *Toxoplasma gondii* antibodies using commercially available Huma Tex TOXO test kits. Out of the 301 women tested, 105 (34.9%) had *Toxoplasma* antibody. Seroprevalence of *Toxoplasma* was seen to be significantly associated with eye disease ($p < 0.05$). However results of this study show low seroprevalence rate, therefore it is the need to include the testing of *Toxoplasma* as a part of the antenatal investigation done on pregnant women and to educate women about the risk factors that lead to *Toxoplasma gondii* infection in order to reduce congenital malformations and death as a result of these infections.

Keywords: *Toxoplasma gondii*, seroprevalence, pregnancy, risk factor

Background

Toxoplasma gondii, is an obligate intracellular parasite found in a wide range of animals, man and birds throughout the world, causes a variety of clinical syndromes in both human and

27 animals. Although *Toxoplasma gondii* has feline species as definitive hosts, a wide range of
28 animals serve as intermediate hosts contributing to the maintenance of infection in nature
29 through harboring viable stages of the parasite in tissues [1].

30 *Toxoplasma gondii* was implicated as significant cause of foetal and neonatal mortality
31 when acquired in-utero and an important contributor to early and later childhood
32 morbidity [2]. Congenital infection occurs only when a woman becomes infected during
33 pregnancy and the severity of the illness is related to the trimester period. It was observed
34 that congenital infections acquired during the first trimester are more severe than those
35 acquired in the second and third trimester [3].

36 Infection with *T. gondii* is usually asymptomatic in immunocompetent hosts or causes a mild
37 flu-like illness. Recent studies have linked toxoplasmosis with change in behavior and may
38 be a causative or contributory factor in various psychiatric disorders such as depression,
39 anxiety and schizophrenia [4]. However, in immune-compromised people, such as AIDS
40 patients or pregnant women may become seriously ill, and it can occasionally be fatal. It
41 causes severe encephalitis and neurologic diseases, and can affect the heart, liver, inner ears,
42 and eyes (chorioretinitis). In congenitally acquired infection; a wide variety of manifestations
43 in the fetus and infant including spontaneous abortion, still-birth, a newborn with
44 hydrocephalus or microcephalus, cerebral calcifications and retinochoroiditis; those leads to
45 mental retardation, blindness, epilepsy, and death [5, 6].

46 *Toxoplasma gondii* has been described as the most widespread zoonotic infection that was
47 implicated as significant cause of foetal and neonatal mortality when acquired in-utero and an
48 important contributor to early and later childhood morbidity. Besides causing serious
49 complications in pregnant women, it could favor or enhance the mother-to-child transmission
50 of HCV, HBV, and HIV vertical transmission [7,8]. However, the seroprevalence of
51 *Toxoplasma gondii* in human population varies greatly among different countries,

geographical areas within the same country, and among the ethnic groups living in the same area [3,9,10]. However high prevalence of toxoplasmosis reported in Ethiopia, it is a neglected disease and infection in pregnant women is unknown. The high prevalence of Toxoplasma infection and its severe consequences in fetus and infant proves the importance of toxoplasmosis in pregnant women. Studies on the prevalence of toxoplasmosis among pregnant women and associated risk factors are scanty in Ethiopia and unavailable in the study area. Therefore, this study was aimed to estimate the seroprevalence of toxoplasmosis and its associated risk factors among pregnant women attending antenatal care (ANC) at Jigjiga City, Eastern Ethiopia.

Materials and Methods

Study design and data collection

A cross sectional study was conducted among pregnant women attending Antenatal clinic (ANC) in three selected health institutes of Jigjiga; Karahmara hospital, Jigjiga health center and Family Guidance Association of Ethiopia (FGAE) from September, 2013 to September, 2014. Jigjiga is the capital city of Ethio-Somali regional state that located about 620km East of Addis Ababa. Both clinical and biological data were collected by qualified and experienced MCH nurses in each study health institution.

Sample size and sampling technique

A single population proportion formula was used to estimate the sample size [11]. The following assumptions were made; 95% confidence level, 5% margin of error and seroprevalence of *T. gondii* among pregnant women of 83.6% from previous study in Jimma [12] and 20% for expected non-response rate. Purposive sampling technique was employed in pregnant women attending ANC in the selected health institute.

Sample collection and laboratory Examination

76 AMCH nurses were identified in each health institution to interview the subjects for socio-
77 demographic and clinical data using the structured questionnaire. After consent was obtained,
78 4 ml of blood sample was collected in disposable tubes under aseptic condition by
79 experienced laboratory technician. These tubes were numbered and processed at the time of
80 collection. The blood sample taken from the individual was centrifuged for 5 minutes and the
81 serum was separated and stored at 4°C to -20°C. For this study, the serological test of
82 *Toxoplasma gondii* was done by Latex agglutination slide test a commercially available kit
83 (Huma Tex Toxo Max-planck-Ring 21.65205 Wiesbaden. Germany). This test detects
84 antibodies of *Toxoplasma gondii* from acute (first 1–2 weeks) to lifelong previous infection.
85 The test reagent is standardized to detect more than 10 IU/ml anti-Toxoplasma antibodies.
86 The presence or absence of a visible agglutination indicates the presence or absence of anti-
87 Toxoplasma antibodies in the samples tested, but it was not possible to distinguish between
88 IgG and IgM. During ANC services HIV infection among pregnant women was determined
89 by anti-HIV antibody test (rapid test currently used in national algorithm for Ethiopia). KHB
90 (Shanghai Kehua Bio-engineering Co., Ltd. China) was used for the first screening and
91 positive samples were re-tested with STAT-PACK (Chembio HIV 1/2 STATPAK™ Assay,
92 CHEMBIO DIAGNOSTIC SYSTEMS, INC., MEDFORD, NY, USA). Samples giving
93 discordant results in the two using the national algorithm tests were re-examined using tie-
94 breaker, (Uni-Gold HIV, Trinity Biotech PLC, Wicklow, Ireland). At end, data obtained from
95 both the questionnaire and laboratory tests were entered and analyzed using the statistical
96 software SPSS version 19.0. Bivariate logistic regression was used primarily to check for
97 variables that have association with the dependent variable. Variables found to have a p-value
98 of < 0.2 in bivariate analysis were fitted into multivariable logistic regression model for
99 controlling the possible effect of confounders and finally variables which had significant
100 association were identified on the basis of 95% confidence interval. A p-value of less than

0.05 was taken as cut of point to declare significant association. Odds ratio was used in assessing strength of association.

Ethical consideration

This study was approved by research ethics and review committee of Jigjiga University and also granted by the same institute. All data were collected after obtaining a written consent from study participants. All participants' confidentiality was kept through use of code.

Results

A total of 301 pregnant women attending antenatal clinic were enrolled in this study. Out of the 301 participant's, 201(66.8%) were from Karahmara Hospital, and the remaining 100(33.2%) were from Jigjiga Health Center and FGAEJigjiga branches. Of 301 pregnant women, 287(95.3%) were living in an urban setting. The majority of the pregnant women, 221 (73.5%) were between the age group of 20 and 34 years. The mean age of the study participants was 25.12 $\pm$ 4.9 years old (range from 15-42 years). Majority of the study participants were housewives 270 (89.7%). About two third (63.1%) of the participants cannot read and write. Majority of the pregnant women were 269(89.4%) monogamy the only wife to their husbands and 178(59.1%)multigravida. One hundred twelve (37.2%) of the pregnant women were in their first trimester while 114 (37.9%) in the second trimester and the remaining 75 (24.9%) in the third trimester.

The overall seroprevalence of *Toxoplasma gondii* among the pregnant women in this study was 105 (34.9%). There was a high rate of *Toxoplasma gondii*sero-positivity; 25.9% in 24–34 years old group subjects (Table 1).

Table.1. Seroprevalence of *Toxoplasma gondi* infection among pregnant women attending antenatal care at Jigjiga city, 2013 (n = 301)

Socio-demographic	<i>Toxoplasma gondi</i> sero-status
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Variables	Positive	Negative	
	N (%)	N (%)	P-value
Residence			
Urban	99 (32.9)	188 (62.5)	0.671
Rural	6 (2.0)	8 (2.7)	
Age in years			
under 20 years	25(8.3)	36 (12)	0.041
20-34	78 (25.9)	143 (47.5)	
35-49	2(0.7)	17 (5.6)	
Educational Status			
Can't read and write	69 (22.9)	121 (40.2)	0.877
Primary level	20 (6.6)	44 (14.6)	
Secondary level +	16 (5.3)	31 (10.3)	
Occupation			
House wife	96 (31.9)	174 (57.8)	0.796
Merchant	7 (2.3)	18 (6.0)	
Others	2 (0.7)	4 (1.3)	
Religion			
Muslim	92 (30.6)	170 (56.5)	0.828
Christian	13 (4.3)	26 (8.6)	
Family type			
Monogamy	89 (29.6)	180 (59.8)	0.106
Polygamy	16 (5.3)	16 (5.3)	
Trimester of pregnancy			
First trimester	31 (10.3)	81 (26.9)	0.110

Second trimester	43 (14.3)	71 (23.6)	
Third trimester	31 (10.3)	44 (14.6)	
Gravidity			
Primigravid	43 (14.3)	80 (26.6)	0.982
Multigravid	62 (20.6)	116 (38.5)	
HIV status			
Reactive	3 (1)	4 (13)	0.357
Non- reactive	97 (32.2)	187 (62.1)	
Not done	5 (1.7)	5 (1.7)	

124

125 With regard to the association of seroprevalence *Toxoplasma gondi* with educational
 126 background, 190 (63.1%) of the pregnant women were can't read and write. Regarding
 127 occupation of the participants, 270 (89.7%) of them were housewives. Majority of the study
 128 women were monogamy and none of the infection was significantly associated with the
 129 family types.

130 **Factors associated with *T. gondi***

131 Domestic cats were recorded from 75 (24.9%) of the study households. About 120 (39.9%)
 132 and 49 (16.3%) of the study participants reported to have a habit of eating raw vegetable and
 133 meat, respectively. Of these, 40 (33.3%) and 14 (28.6%) were *T. gondii* seropositive,
 134 respectively. About 119 (39.6%) of the pregnant women had reported to have a history of
 135 engagement in farming activities, which could indicate frequent contact with soil. Of these,
 136 39 (32.8%) of them were seropositive. Overall, 38 (12.6%) of the study participants reported
 137 to have eye disease. Sero-prevalence among those who reported to have eye disease was

138 4(10.5%). Among pregnant women with HIV history 7(2.3%), 3 (42.9%) were positive for *T.*
 139 *gondi*. (Table 2).

140

141 Table 2: Association of *Toxoplasma gondi* seropositivity and Risk factors among pregnant
 142 women attending antenatal care at Jigjiga city, 2013 (n = 301)

	<i>Toxoplasma gondi</i>				
variables	Positive	Negative	Odd	95%(CI)	P- value
	N (%)	N (%)	Ratio		
Cats in house hold					
Yes	18(6)	57(18.9)	1.499	0.73-3.05	0.281
No	87(28.9)	139 (46.2)			
Handles cats litter					
Yes	5 (1.7)	16 (5.3)	1.325	0.36-4.81	0.602
No	100 (33.2)	180 (59.8)			
Outdoor gardening					
Yes	36 (12)	90 (29.9)	1.845	0.84-4.04	0.111
No	69 (22.9)	106 (35.5)			
Engage in Farming					
Yes	39 (13)	80 (26.6)	0.749	0.35-1.56	0.398
No	66 (21.9)	116 (38.5)			
Consume raw meat					
Yes	14 (4.7)	35 (11.6)	1.365	0.59-3.11	0.448
No	91 (30.2)	161 (38.5)			

Consume raw vegetables					
Yes	40 (13.3)	80 (26.6)	0.813	0.42-1.56	0.470
No	65 (21.6)	116 (38.5)			
Not washing fruits					
Yes	25 (8.5)	56 (18.6)	1.214	0.60-2.42	0.489
No	80 (26.6)	140 (46.5)			
Contact with dog					
Yes	5 (1.7)	9 (3)	0.226	0.05-1.11	0.059
No	100 (32.2)	187 (62.1)			
Miscarriage					
Yes	1 (0.3)	3 (1.0)	0.782	0.05-10	0.795
No	104 (34.6)	193 (64.1)			
Still birth					
Yes	3 (1)	12 (4.0)	1.96	0.49-7.70	0.293
No	102 (33.9)	184 (61.1)			
Eye disease					
Yes	4 (1.3)	34 (11.3)	7.41	2.14-25	0.002
No	101 (33.6)	162 (53.8)			
HIV sero -status					0.415
Yes	3 (1.0)	4 (1.3)	0.467	0.120-1.809	0.270
No	97 (32.2)	187 (62.3)	0.887	0.103-7.630	0.913
Not done	5 (1.7)	5 (1.7)			

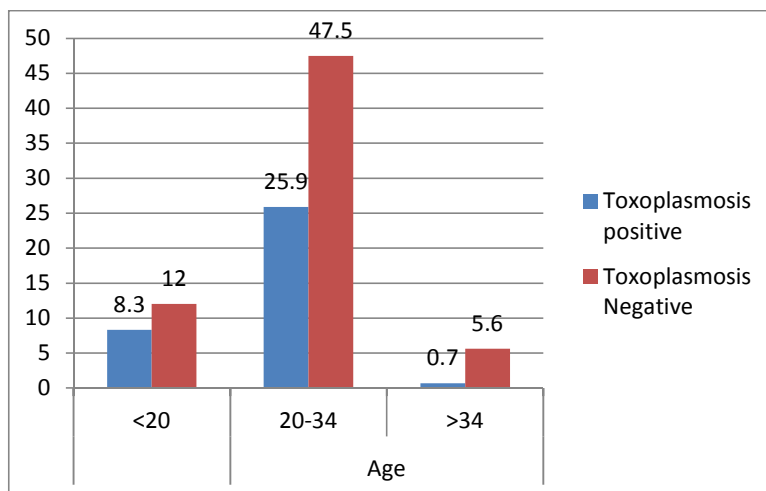


Figure 1. *Toxoplasma gondii* seroprevalence in pregnant women by age category (<20: AOR; 4.64, 95%CI 1.25-27, 20-34: AOR; 5.9, 95%CI 1.04-20).

Discussion

This study showed, the overall seroprevalence of *T. gondii* among the pregnant women was 34.9%. The study result is in line with that reported from Lagos, Nigeria (32.6%) [13], Sudan (34.1%) [14]. However, the study results were higher than the prevalence among similar population in Jazan Saud Arabia (24.1%) [15] and Burkinafaso (20.2%) [6]. In contrast, the study results were lower than the seroprevalence of *T. gondii* reported in Jimma (83.6%) [12], central Ethiopia (81.4%) [16]. This wide variability of seroprevalence could be attributed to differences in climatic conditions, geographic variation, personal hygienic practices, feeding habits, socio-economic, sensitivities of serological techniques employed, traditional practice, cat densities in the areas and access of cat to contaminate feed and water with oocysts. When Age specific prevalence was considered age group 20-34 years had higher (25.9%) prevalence of *Toxoplasma gondii* infection. (Fig.1)

The study observed a significant association of *Toxoplasma gondii* seropositivity with age category. Pregnant women within the age group of 20-34 years were 7 times more likely to acquire *Toxoplasma gondii* infection as compared with other age group ($p=0.025$, $OR=5.9$, $95\%CI=1.25-27$). This trend was similar to the data from a previous study in Jazan province

Saudi Arabia[15]. However, in other studies in Jimma [12] and Lagos, Nigeria [13] had reported an increase in seropositivity with increasing age of antenatal women. Such discrepancy might be due to the differences in population distribution in each age group or more exposure of those age group populations. So this study generally highlights the need to continue to educate women of child-bearing age on prevention of Toxoplasmosis.

Different predisposing factors for *Toxoplasma gondi* infection; consisting of contact with some domestic animals, involvement in farming, feeding behavior and HIV sero-status were assessed in this study. However, none of the predisposing factors except history of eye disease has a statistically significant association with *Toxoplasma gondi* infection. Pregnant women with history of eye disease were 7.41 times more likely to acquire *Toxoplasma gondii* infection as compared at those with no history of eye problem ($p=0.002$, $OR=7.41$, $95\%CI=2.14-25$). In other hands, variables like no washing fruits, handling cats litter, consuming raw meat, presence of cats in the house hold, outdoor gardening and still birth showed increased odds ratio (1.21, 1.32, 1.36, 1.49, 1.85 and 1.96) of infection, respectively, but without significant associations (P value > 0.05 for all). However high seroprevalence of *Toxoplasma gondii* was observed in those with lower level of education, second trimester of gestation and multiple gravid, the statistical test showed no significance.

Limitation

Study didn't used confirmatory tests that differentiate IgM from IgG which are usually identified acute from latent infection. This study was also a cross sectional study that conducted at institution which may not represent community.

Conclusion

More than one thirds of the pregnant women in our study were positive for *T.gondii* infection. This seroprevalence of *T. gondii* infection shows the need for preventive and control measures of toxoplasmosis; mainly health education of pregnant women about the

188 transmission and prevention methods at antenatal care clinics. Although the research didn't
189 provide a complete picture of prevalence of *T. Gondii* infections in the entire population
190 of Jigjiga area, it clearly showed that *T. Gondii* is prevalent in the study area. Eye disease was
191 the risk factor for *Toxoplasma gondii* infection; however a strong comparative study is needed
192 to confirm its mechanism for transmission. So, preventive measures and establishing
193 diagnostic toxoplasmosis tests during pregnancy are warranted. Furthermore, studies using a
194 larger sample size will be required to assess the risk of mother-to-child transmission of
195 *Toxoplasma gondii* separately and impact of *T. gondii* on this regards.

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