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Toxoplasmosis Sero-Prevalence, Awareness and Risk Behavior Among Pregnant Women Following Antenatal Care in Asella Teaching and Referral Hospital, Asella, Ethiopia

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Abstract: Toxoplasmosis is caused by infection with the protozoan Toxoplasma gondii (T. gondii), an obligate intracellular parasite. The infections produced a wide range of clinical syndromes in humans, land and sea mammals, and various bird species. Toxoplasmosis is especially important among Immune-compromised patients and pregnant women. Infection of mothers during pregnancy by Toxoplasma gondii may have serious consequences for fetus ranging from miscarriage, central nervous system involvement, retinochoroditis, or at birth subclinical infection. Objectives: To determine Toxoplasmosis sero-prevalence, awareness and risk Behavior among pregnant women following antenatal care in Asella Teaching and Referral Hospital, Asella, Ethiopia. Methods: Institutional based quantitative cross sectional study design was conducted on sample size of 384 from December 1, 2018 to June 30, 2019. To collect the demographic and risk factor related data a pre-tested Structured, questionnaire was used. Serum sample, collected was tested for Toxoplasma Immunoglobulin G (IgG) and Toxoplasma Immunoglobulin M (IgM) antibodies using anti- IgG and IgM antibodies by Toxoplasma immune-chromatographic test (ICT) IgG-IgM test. To show association between the dependent and independent variables a bivariable and multivariable logistic regression model was applied allowing for p, 0.05 and the confidence interval 95%. Result: The overall sero- prevalence of T. gondii in the study area was 81.8%. Three hundred and fourteen (81.8%) of the pregnant women were IgG seropositive, fifty women (13%) were IgM seropositive. fifty women were positive for both IgG and IgM. None of the pregnant women were positive exclusively for IgG and IgM ani-bodies. eating raw meat (COR=3.480, 95%CI: 1.450-8.352; P=0.005, AOR=3.798, 95%CI: 1.249-11.550, P=0.19), using unpasteurized milk (COR=3.860, 95%CI: 2.118-7.037; P=0.000, AOR=3.907, 95% CI: 1.744-8.751, P=0.001), having three or more children (COR=2.194, 95%CI: 1.065-4.518; P=0.033) and Consumption of raw egg (COR=2.042, 95%CI: 1.049-3.974; P=0.036). Conclusion: The sero-prevalence of T. gondii antibodies was high among the pregnant women. Those who consumed raw meat and egg, unpasteurized milk and those who have three or more children were at higher risk of T. gondii infection. Hence, blood screening for Toxoplasmosis, health education and awareness creation among pregnant women should be done during antenatal follow up.

Keywords: Sero-prevalence, Pregnant Women, Risk Factors. *T. gondii*, Asella, Ethiopia

1. Introduction

Toxoplasmosis is caused by the *Toxoplasma gondii (T. gondii)*, an obligate, intracellular protozoan, which is a widespread zoonotic parasite which can infect all warm-blooded animals [1], and is one of the most common zoonosis in the world [2]. Because of the existing high rates of infection between the human populations (expected as 30–50%) it is considered a global health hazard [3]. In Ethiopia the highest prevalence (95.1%) was reported from Butajira from patients found in 15-49 age groups [4], 94% prevalence among HIV/AIDS patients from Tikur Anbessa Specialized Hospital [5], and 85.4% among pregnant women in Addis

Ababa [6]. Toxoplasmosis is witnessed by a wide range of clinical conditions. The majority of infections is naturally asymptomatic or causes a slight self-limiting 'flu' like illness. Infection at primary pregnancy can be spread to the fetus and causes hereditary toxoplasmosis and finally resulted in miscarriages, in utero death, delay growth in neonate, ophthalmic and neurological diseases [7-10].

The expected global problem of hereditary toxoplasmosis was 19,000 new cases each year resulting in the loss of about 1.2 million Disability-Adjusted Life Years (DALYs) [11].

Cats and other felines are the final hosts of *T. gondii* and accordingly the lone source of ecologically resistant oocysts in nature. From the major routes of infections for humans some of them are: close interaction with cats or cat excreta ingestion of oocysts, eating of foods or soil polluted with oocysts and drinking of contaminated water with oocysts; ingestions of tissue cysts due handling/consumption raw or undercooked meat of infected animals hosts, transplantation of infected organs, blood transfusion and congenital infection. Drinking of unpasteurized milk from infected animals and eating of raw egg can also transmit this parasite [9, 12-13].

Antenatal screening for *T. gondii* infection is based detection of anti-toxoplasma specific IgM and IgG is the backbone in controlling the risk of inherited toxoplasmosis. Maternal-fetal intervention can be attained through drugs such as spiramycin which stop congenital toxoplasmosis by more than 60% [14].

Exposure rates to toxoplasmosis vary greatly to the topographical locality, socioeconomic prominence, traditional and spiritual opinions of a population [15]. Therefore, there is a necessity to determine the prevalence in different locations. Confirmation of zoonotic infection among cats and livestock animals of Ethiopia is the illustrations of the presence of the parasite and hence the potential for human infection [16-18]. Current trends in foods and lifestyle with fast foods substituting traditional cooking and popularity of cohort animals, (especially cats, as they require minimal care) and the plenty of stray cats, could increase the probability of experience to toxoplasmosis.

Prevention of congenital toxoplasmosis depends mainly on avoidance of risk factors during pregnancy. But, uncertainty about how most women acquire infection results in advice to avoid numerous risk factors which makes compliance difficult. Therefore, alertness is required with regard to toxoplasmosis and identification of significant associations between known risk factors and sero-positivity to *T. gondii* among susceptible groups. This will be surely helpful in adopting appropriate prevention and control methods as accommodated for each group. In addition since, only few sero-prevalence among females and neonates have been studied and there is no antenatal screening program for pregnant women for toxoplamosis in Ethiopia and also there is no studies have investigated the sero-prevalence, awareness of toxoplasmosis and related preventive Behaviour patterns among pregnant women in Aris zone, it necessities to have evidence concerning *T. gondii in* Arsi zone.

Therefore, the aim of this study is to determine Toxoplasmosis sero-prevalence, awareness and risk Behaviour among pregnant women following antenatal care in Asella Teaching and Referral Hospital, Asella, Ethiopia.

2. Methods and Materials

2.1. Study Area and Period

An institutional based cross-sectional study design was done at Asella Teaching and Referral) Hospitals from December 01, 2018 to February 30, 2019. Asella Teaching and Referral Hospital found in Assela town, Arsi Zone, at 175 kilometers to the east of Addis Ababa, the capital city of Ethiopia.

2.2. Study Design and Period

Cross-sectional study design was conducted from December 01, 2018 up to February 30, 2019 to determine the sero-prevalence of toxoplasmosis, awareness and its associated risk factors in Asella Teaching and Referral Hospital.

2.3. Source and Study Population

2.3.1. Source Population

All pregnant women in Asella referral and teaching Hospital catchment area.

2.3.2. Study Population

All pregnant women following antenatal care in Asella referral and teaching Hospital.

2.4. Eligibility Criteria

1) Inclusion criteria: A pregnant woman who was come to selected Hospitals for the first time for antenatal care during sample collection period for current pregnancy.
2) Exclusion criteria: Mothers who can't respond because of serious illness and who was come more than once during sample collection period to selected Hospital for antenatal service.

2.5. Sample Size Determination and Sampling Technique

2.5.1. Sample Size Determination

The sample size was calculated to estimate the prevalence of toxoplasma antibodies in this population. For the calculation, prevalence was assumed to be 50% because there is no previous research done on this parasite among pregnant women in Arsi zone by bearing in mind a confidence interval of 95% and the tolerable difference to be 5%, the least required sample size was 384. The sample was collected by engaging all agreeable pregnant women at their first visit to the antenatal clinic of Asella Teaching and Referral Hospital.

$$\text{Sample size} = \frac{(\text{Z}\,\alpha/2)^2\ \text{p}\ (1-\text{p})}{\text{d}^2}$$

Where:

P: An estimate of the prevalence rate for the population

(P=50%)

d: absolute precision (d=5%=0.05)

Zα/2: The standard normal variable at 95% confidence level when α=5%. (Z α/2=1.96)

$$\text{So, } n = \frac{Z\,\alpha/2)^2\ p\ (1-p)}{d^2} = \frac{2(1.96)^2 x\ 0.5\ (1-0.5)}{(0.05)^2} = 384$$

2.5.2. Sampling Techniques

All pregnant women who were come to Asella Teaching and Referral Hospital for the 1st time for antenatal care and willing to participate in the study were included until required sample size was achieved.

2.6. Data Collection and Analysis Procedures

2.6.1. Socio Demographic and Clinical Features

After clear training was given for five midwifes, five medical laboratory technologists and five facilitators from who were selected from Asella teaching and referral hospitals data collection was started. To collect Socio demographic and clinical features a pretested questionnaire was administered by Midwifes and trained research assistants' information from pregnant women at selected hospitals antenatal care unit was gathered. The questions was produced information on four major areas: (a) socio-demographic information of the participants such as age, ethnicity, level of education, employment status, marital status, area of residence; (b) details of prior adverse birth outcomes, from multigravida i.e. miscarriages, still births, children with delayed milestones; (c) disease-related risk factors such as cat ownership, personal hygiene (frequency of hand washing), kitchen hygiene (frequency of washing utensils, cutting board and knife after preparation of meat), consumption of raw meat, cooking of meat, frequency of consuming unwashed raw vegetables and fruits, frequency of having non-homemade meals and exposure to soil; and finally, (d) the awareness of toxoplasmosis and sources of information. After implementation the questionnaire, each subject will be educated on significance and prophylactic actions against toxoplasmosis using an information sheet.

2.6.2. Laboratory Tests

Two milliliters of blood was collected aseptically from each participant into sterile containers and centrifuged in the collected Hospitals and serum was separated by trained laboratory technologist at Arsi University Asella Teaching and Referral Hospital laboratory department. At Arsi University Asella Teaching and Referral Hospital laboratory department, the serum was tested on the day of receipt for *T. gondii*-specific antibodies using a commercial kit (*On Site* Toxo IgG/IgM Rapid Test-Dip Strip® CTK Biotech. Inc. USA) according to the manufacturer's instructions by two senior laboratory technologists. The participants were made aware of the results of the serological investigations and its interpretation.

2.6.3. Data Analysis Procedures

Data generated from questionnaire survey and laboratory investigations was recorded and coded using Microsoft Excel spreadsheet (Microsoft Corporation) and was analyzed using STATA version 13.0 for Windows (Stata Corp. College Station, TX, USA) by researchers. The sero-prevalence was calculated as the number of seropositive samples divided by the total number of samples tested. To identify predictors of sero-positivity, first the association of the potential risk factors (age, gestational age, educational status, contact with cats' feces, presence of domestic cat, way of life of domestic cats, etc) was analyzed by univariable logistic regression. Then all non- collinear variables with P-value ≤ 0.25 in univariable logistic regression analysis was included in the final multivariable logistic regression model to construct the likely model ($P < 0.05$). The model will be reduced by backwards elimination of non-significant variables ($P > 0.05$) based on likelihood ratio test to define the model that would best fit the data.

2.7. Dissemination of Research Finding

The research findings will be presented to the Arsi University and other stake holders, shared to Arsi Zonal Health Bureau, Regional Health Bureau, Federal Minister of Health (FMOH) and organizations/partners working on human health in the country. Finally effort will be made to publish the findings on peer reviewed scientific journal.

2.8. Significance and Beneficiary of the Study

The finding will be significant both for researcher, communities and government in adding information regarding Toxoplasmosis sero-prevalence, awareness, and risk Behaviour among pregnant women following antenatal care in Arsi zone, Ethiopia. Nationally it develops the understanding of relationship between having cat, eating raw meat and vegetables, blood transfusion, organ transplantation, drinking contaminated water, eating soil and so on with congenital toxoplasmosis.

2.9. Expected Outcome

A wide range of data based on which rigorous generalizations and recommendations can be made based on the data was obtained from the diversity score survey and laboratory analysis of sample.

2.10. Quality Assurance

Strict measures were taken throughout the analytic process. Five percent of the Questionnaire was pre-tested among pregnant women attending at Asella Referral and teaching Hospital (Asella town), and Questionnaire was revised accordingly. Data collectors were trained for 3 days on how to con duct the interview and the sampling process. Completed questionnaires were reviewed immediately to ensure accuracy and legibility. Quality control samples were tested parallel with the research samples and standard operating procedures were followed during the laboratory investigation.

3. Results

3.1. Socio-demographic Characteristics

A total of 384 pregnant women with a reply rate of 100% of which majority (65%) of them were urban dwellers and the mean age (± SD) of the study subjects were 26.2 (± 6.55) years were included in the study. The majority (51%) of the study members were found within the age cluster of 15-24.9 years. Nearly all (98.2%) of the study members were not have any information about Toxoplasmosis and its mode of transmission (Table 1).

Table 1. *Sero-prevalence of Toxoplasma gondii antibody and the associated risk factors among pregnant women (n=384), Asella, Ethiopia 2019.*

	Total n (%)	Negative n (%)	Positive n (%)	P-Value	COR 95%(CI)	P-Value	AOR 95%(CI)
Age group (in Years)							
15-24.9	196 (51%)	35 (50%)	161 (51.2%)	.943	1	.736	1
26-24.9	174 (45.3%)	32 (45.7%)	142 (45.2%)	.738	1.255 (.332-4.734)	.658	0.551 (.039-7.704)
35+	14 (3.6%)	3 (4.3%)	11 (3.5%)	.779	1.210 (.319-4.590)	.553	0.457 (.034-6.076)
Educational Status							
Illiterate	29 (7.6%)	5 (7.1%)	24 (7.6%)	.723	1	.470	1
Incomplete elementary school	120 (31.3%)	26 (37.1%)	94 (29.9%)	.900	.928 (.290-2.974)	.614	0.694 (.168-2.866)
Complete elementary school	46 (12%)	4 (5.7%)	42 (13.4%)	.602	1.232 (.562-2.701)	.274	1.67 (.667-4.182)
Incomplete high school	30 (7.8%)	6 (8.6%)	24 (7.6%)	.167	.424 (.126-1.432)	.319	0.496 (.125-1.970)
Complete high school	73 (19%)	13 (18.6%)	60 (19.1%)	.849	1.114 (.368-3.373)	.565	1.476 (.392-5.558)
Incomplete higher education	26 (6.8%)	5 (7.1%)	21 (6.7%)	.938	.965 (.397-2.344)	.329	1.668 (.598-4.656)
Complete higher education	60 (15.6%)	11 (15.7%)	49 (15.6%)	.922	1.061 (.328-3.432)	.673	1.348 (.337-5.390)
Trimesters							
First (<14weeks)	77 (20.1%)	8 (11.4%)	69 (22%)	.068	1	.124	1
second<14-28 weeks)	150 (39.1%)	26 (37.1%)	124 (39.5%)	.024	0.39 (.171-.886)	.062	.410 (.161-1.047)
Third (>28 weeks)	157 (40.9%)	36 (51.4%)	157 (40.9%)	.223	0.705 (.401-1.238)	.879	1.055 (.531-2.093)
Information About *Toxoplasmosis*							
Yes	7 (1.8%)	1 (1.4%)	6 (1.9%)		1		1
No	377 (98.2%)	69 (98.6%)	308 (98.1%)	.786	.744 (.088-6.279)	.789	.713 (.059-8.546)
Number of children							
< or=one	150 (39.1%)	31 (44.3%)	119 (37.9%)	.075	1	.063	1
two	115 (29.9%)	13 (18.6%)	102 (32.5%)	.814	1.073 (.596-1.931)	.764	.891 (.420-1.891)
three and above	74 (19.3%)	16 (22.9%)	58 (18.5%)	.033	2.194 (1.065-4.518)*	.034	.389 (.163-.931)*
History of abortion							
Yes	119 (31%)	100 (31.8%)	19 (27.1%)	.442	.797 (.447-1.421)	.240	.669 (.342-1.308)
No	265 (69%)	214 (68.2%)	51 (72.9%)		1		1
History of contact with cat's feces							
Yes	375 (97.7%)	67 (95.7%)	308 (98.1%)	.248	.435 (.106-1.784	.078	.203 (.342-1.308)
No	9 (2.3%)	3 (4.3%)	6 (1.9%)		1		1
Consumption of fruit and vegetables without adequate hygiene							
Yes	302 (78.6%)	59 (84.3%)	243 (77.4%)	.206	1.567 (.781-3.143)	.953	.971 (.361-2.609)
No	82 (21.4%)	11 (15.7%)	71 (22.6%)		1		1
Consumption of raw fruit and vegetable							
Yes	359 (93.5%)	65 (92.9%)	294 (93.6%)	.813	0.884 (.320-2.443)	.089	.285 (.067-1.209)
No	25 (6.5%)	5 (7.1%)	20 (6.4%)		1		1
Consumption of raw meat							
Yes	301 (78.4%)	64 (91.4%)	237 (75.5%)	.005	3.480 (1.450-8.352)*	.019	3.798 (1.249-11.550)*
No	83 (21.6%)	6 (8.6%)	77 (24.5%)		1		1
Consumption of undercooked raw meat							
Yes	361 (94.0%)	67 (95.7%)	294 (93.6%)	.509	1.519 (.439-5.261)	.812	1.227 (.227-6.623)
No	23 (6%)	3 (4.3%)	20 (6.4%)				1
Consumption of unpasteurized milk							
Yes	200 (52.1%)	54 (77.1%)	146 (46.5%)	.000	3.860 (2.118-7.037)*	.001	3.907 (1.744-8.751)*
No	184 (47.9%)	16 (22.9%)	168 (53.5%)		1		1
Consumption of raw egg							
Yes	52 (13.5%)	15 (21.4%)	37 (11.8%)	.036	2.042 (1.049-3.974)*	.122	1.921 (.840-4.391)
No	332 (86.5%)	55 (78.6%)	277 (88.2%)		1		1
Blood donated or organ transplanted before							
Yes	18 (4.7%)	5 (7.1%)	13 (4.1%)	.288	1.781 (0.614-5.170)		1.114 (.318-3.904)
No	366 (95.3%)	65 (62.9%)	301 (95.9%)				

	Total n (%)	Negative n (%)	Positive n (%)	P-Value	COR 95%(CI)	P-Value	AOR 95%(CI)
Type of water for drinking							
public supply filtered	271 (70.6%)	60 (85.7%)	211 (67.2%)	.060	1	.289	1
public supply unfiltered	85 (22.1%)	7 (10%)	78 (24.8%)	.523	1.991 (.240-16.498)	.902	0.865 (086-8.686)
well water filtered	14 (3.6%)	1 (1.4%)	13 (4.1%)	.683	0.628 (.067-5.862)	.345	0.313 (0.028-3.493)
well water unfiltered	6 (1.6%)	1 (1.4%)	5 (1.6%)	.678	0.538 (.029-9.985)	.553	0.393 (0.018-8.571)
Bottled mineral water	8 (2.1%)	1 (1.4%)	7 (2.2%)	.826	1.400 (0.07-28.120)	.854	.738 (0.029-18.873)
Presence of rat at home							
Yes	276 (71.9%)	51 (72.9%)	225 (71.7%)	.840	1.06 2 (.594-1.899)	.856	.937 (.463-1.895)
No	108 (28.1%)	19 (27.1%)	89 (28.3%)		1		1

*=statistically significant at p, 0.05, COR: Crude Odds Ratio, AOR: Adjusted Odds Ratio, CI: Confidence Interval, n=number.

3.2. Sero-prevalence and Risk Factors for Toxoplasmosis

The serum sample was collected from 384 gravid women for the serological examination out of these, 314 (81.8%) were found to be positive for anti-bodies specific to *T. gondii*. Furthermore, 264 (68.8%) were found to be positive only for IgG; the rest 50 (13%) were positive both for IgM and IgG (Table 2).

Table 2. *IgG sero-prevalence status of study Participant * IgM sero-prevalence status of study Participant Cross tabulation (n=384), Asella, Ethiopia 2019.*

			IgM sero-prevalence status of study Participant		Total
			positive	negative	
IgG sero-prevalence status of study Participant	positive	Count	50	264	314
		% of Total	13.0%	68.8%	81.8%
	negative	Count	0	70	70
		% of Total	0.0%	18.2%	18.2%
Total		Count	50	334	384
		% of Total	13.0%	87.0%	100.0%

Out of the 50 women with recent infection, 10 were in the first trimester, 22 were in the second trimester and only 18 mothers were in the third trimester of pregnancy (Table 3).

Table 3. *Respondent's Gestational age * IgM sero-prevalence status of study Participant (n=384), Asella, Ethiopia 2019.*

			IgM sero-prevalence status of study Participant		Total
			positive	negative	
Respondent's Gestational age	first trimester	Count	10	67	77
		% of Total	2.6%	17.4%	20.1%
	second trimester	Count	22	128	150
		% of Total	5.7%	33.3%	39.1%
	third trimester	Count	18	139	157
		% of Total	4.7%	36.2%	40.9%
Total		Count	50	334	384
		% of Total	13.0%	87.0%	100.0%

According to the bivariate and multivariate logistic regression analysis, 21 variables including: age, educational level, trimester of pregnancy, source of drinking water, presence of rat at home, contact with cat's feces, consumption of raw: egg, milk, meat, undercooked meat, undercooked embedded meat, and fruit and vegetable / fruit and vegetables without adequate hygiene, Gestational age, blood donated or organ transplanted before, contact with soil without glove, abortion history, number of prenatal care appointments, number of pregnancies information about toxoplasmosis were included. From these risk factors for *Toxoplasmosis eating raw meat* (OR=3.480, 95%CI: 1.450-8.352; p-value=0.005, AOR=3.798, 95%CI: 1.249-11.550, p-value=0.19), using unpasteurized milk (OR=3.860, 95%CI: 2.118-7.037; p-value=0.000, AOR=3.907, 95%CI: 1.744-8.751, p-value=0.001), having three or more children (OR=2.194, 95%CI: 1.065-4.518; p-value=0.033) and Consumption of raw egg (OR=2.042, 95%CI: 1.049-3.974; p-value=0.036) were indicated substantial association with anti-Toxoplasma antibody sero- positivity of the pregnant women (Table 1).

4. Discussion

Previously there wasn't known any information about the sero-prevalence of *T. gondii* in Arsi zone and this is the first report of *T. gondii* infection in Asella, Ethiopia. The sero-prevalence of *T. gondii* among pregnant women in the study area was found to be 81.8% (Table 2). This discovery is larger than the findings from Arba minch, Ethiopia 79.3% [19], Brazil 68.6% [20], Ghana 51.2% [21], Tanz ania 30.9% [22], Sri L anka 29.9% [23], China 16.8% [24], and Mexico 10.8% [25]. The present discovery is similarly higher than the sero-prevalence of *T. gondii* in the lower altitude and higher humidly cities of Kenya: Kisumu (52%) and

Mombasa (57%) [26]. But silt lower than Bench Maji Ethiopia 85.3% [27] and Addis Ababa 85.4% [28].

Amongst the sero-positive females, the majority of them were found to have a chronic or past infection. But, fifty women (50/314, 16%) or 13% of the 384 women was found to have a recent infection (Table 2) which is higher than the studies conducted in Arba Minch Hospital 9 (3.9%) and Mizan Aman General Hospital 7 (3.0%) in Ethiopia [19, 27]. Bearing in mind the asymptomatic nature of the disease and the opportunity of congenital spread, the serologic finding of this study should not be overlooked. This is because the health -care facilities in the study area lack specific tests for *T. gondii* and diagnosis isn't completely made which may result in misdiagnosis or delayed diagnosis.

In this study, there were 21 different risk factors have been also evaluated for the sero- prevalence of *T. gondii* but only: eating raw meat, drinking unpasteurized milk, eating raw egg and having three or more children (Table 1) were showed significant association. This discovery is consistent with the studies conducted in Tanzania [22], Mali [29] and have of south of Iran [30].

In these discoveries, contact with garden soil, owing to a domestic cat or presence of rat at home, and consumption of raw vegetables, inadequate washing of fruits and vegetables, educational status, contact with cat's feces and soil without gloves weren't showed significantly associated with *T. gondii infection* (Table 1) which contradicted earlier studies conducted in Ethiopia [19, 27, 30], China [32] and Brazil [33]. This inconsistency might be due to the dissimilarities in socioeconomic status, personal hygiene practices, feeding habits, differences in testing methods, variation immune status of the study members and sample size of each study.

Cats and dogs are supposed to be the vital amps of contamination of *T. gondii* [34]. In the Ethiopian situation, it is common to see household cats live and sleep to get her with human beings. Cats can directly contaminate humans, other animals, and their neighboring through their feces [35]. Likewise, after contact with cat's feces, dogs can pay to the spread of the organism through mechanical contamination of garden soil, vegetables, and human beings. Therefore, human beings can perhaps get the infection or swallow the oocyst of the parasite through their contaminated hands after direct contact with cats or dogs, garden soil, and surfaces or ingesting of polluted vegetables. Oocysts of *T. gondii* are hard free living phases of the parasite, and consequently are a key contributor to infections related with the above-mentioned risk factors [34]. Since they on the other hand, cats or dogs may get the contagion from other warm blooded animals through carnivore contamination, and in sequence infect human creatures [36].

This study was showed as the difference in educational status of the study participants have no effect on the sero-prevalence, because only 1.8% was heard about *Toxoplasmosis* even though they were in different educational level and 98.2% doesn't have any information (table 1). This agrees with the study done in Hawassa and Yirgalem Hospitals southern, Ethiopia which indicated as 99.6% of the study participants was no information about *Toxoplasmosis* [37]. But in reality it is extremely important to increase awareness on the transmission of toxoplasmosis at all level.

Even though it weren't showed significant association with *Toxoplasmosis in this* study, contact with: cat's feces, contaminated soil and water, raw or under cocked fruits and vegetables, gestational age, information about toxoplasmosis, abortion history and presence of rat and domestic cat's it is important to prevent these risk factors as it is evidence by different researches as these were some of the risk factors for *Toxoplasmosis* [19, 27, 30, 32, 38-41]. But some of current findings agree with research done in northwest Ethiopia which showed as there are no any significant risk factors associated with sero-positivity in relation socio-demographic characters, gestational age, gravidity, consumption of raw vegetable, and blood transfusion [28, 42].

5. Conclusions

The sero-prevalence of T. gondii antibodies was high among the pregnant women. Those who consumed raw: meat, milk and egg were at higher risk of T. gondii infection. Hence, blood screening for Toxoplasmosis, health education and awareness creation among women of reproductive age group in general and pregnant women in particular should be done during antenatal follow up. It is also alarming to add Toxoplasmosis screening during antenatal checkup. Furthermore, there is prerequisite to control urban stray cat inhabitants to decrease the risk of zoonotic spread of the parasite and further epidemiological studies to determine additional risk factors, economic and health impact of toxoplasmosis are called for.

Abbreviations

FMOH	Federal Minister of Health
ICT	Chromatographic test
IgG	Immunoglobulin G
IgM	Immunoglobulin M
PI	Principal Investigator
RPD	Research and publication director

Declarations

Ethics Approval and Consent to Participate

The study was approved by the Ethical Review Committee of the Arsi University Collage of Health Sciences by Ref. No. 2-16/09/151/11 by date of 12 November 2018 with budget code COHS/R/0033/2018/19. Informed written consent was obtained from the participating pregnant women at the first booking visit. The participants were informed that enrolment to the study was purely voluntary and non-participation was not in any way influence the services provided by the antenatal clinic.

Consent for Publication

Not applicable

Availability of Data and Materials

The data sets used and /or analyzed during the current study are available from the corresponding author or on reasonable request.

Conflict of Interest

The authors declare that there is no conflict of interests.

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Authors' Contributions

SA provided conceptual framework for the project, data collection, guidance for interpretation of the data, perform data analysis, participated in the Parasitological work, performance of statically analysis and guidance for data interpretation. I also read and approved the final manuscript.

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