ADDIS ABABA UNIVERSITY

COLLEGE OF HEALTH SCIENCE, SCHOOL OF ALLIED SCIENCES

DEPARTMENT OF MEDICAL LABORATORY SCIENCE

Seroepidemiology of *Toxoplasma Gondii* infection and its risk factors in women of child-bearing age in selected health institutions of central Ethiopia

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Acronyms

AIDS- Acquired Immune Deficiency Syndrome

ANC- Anti Natal Care

ART- Anti-retroviral therapy

CTox- Congenital Toxoplasmosis

DNA- Deoxyribo Nucleic Acid

DMLS- Department of Medical Laboratory Sciences

ELISA- Enzyme Linked ImmunoSorbent Assay

FMOH- Federal Ministry of Health

HC- Health Centers

HIV- Human Immunodeficiency Virus

IgG- Immunoglobulin G

IgM- Immunoglobulin M

MASL-Meters Above Sea Level

MAT- Modified Agglutination Test

MDAT- Modified Direct Agglutination Test

NAHIDC-National Animal Health and Investigation Diagnostic Centre

NGO- Non Governmental Organization

OD- Optical Density

PCR - Polymerase Chain Reaction

PMTCT- Prevention of Mother To Child Transmission

PNC- Post Natal Care

RPM - Revolution per Minute

SFT- Sabin Feldman Test

SOM- School Of Medicine

SPSS- Statistical Package for Social Sciences

SVM- School of Veterinary Medicine

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ABSTRACT

Background: Toxoplasmosis is an important zoonotic parasitic disease worldwide.Congenital transmission of *T. gondii* during pregnancy has been regarded as a risk factor for the health of newborn infants.Prevalence and risk factors of toxoplasmosis in women of childbearing age in Ethiopia are unknown.

Objective: Estimating the seroprevalence and potential risk factors in acquiring *T. gondii* infection by women of child-bearing age in Central Ethiopia.

Methods A cross-sectional study was conducted from May 2011 to January 2012 in child bearing age women of sample size of 425 in central Ethiopia. Indirect ELISA IgG and IgM test in parallel structured questionnaire was used to assess possible risk factors and knowledge and perception of health professionals about the disease. The data was cleaned, coded using Microsoft excel sheet and transferred to SPSS soft ware's version 20 for data analysis.

Results: The study revealed that anti-*T. gondii* antibodies were detected in 81.4% of the samples of which 69.4% were positive for only IgG and 12.0% positive for both IgG and IgM antibodies. Of the 213 pregnant women 57 (26.8%) were IgM reactive. Out of 17 potential risk factors investigated, univariable logistic regression showed significant association of *T. gondii* infection with study area, age, pregnancy status, raw vegetable consumption, source of water, presence of cat at home, contact with cat, HIV status and precaution during cats' feces cleaning ($P \leq 0.05$). Almost all child bearing age women had no awareness or information regarding health risk of cats and toxoplasmosis. From health professionals, 63% (63) of them had knowledge of toxoplasmosis. Among health professionals 47.3% didn't knew the importance of testing toxoplasmosis during pregnancy and (93%) do not screen pregnant women but 78% of them had an exposure of toxoplasmosis in patient and all of them didn't gave health education.

Conclusion: Results of current study showed that the seroprevalence of *T. gondii* infection in women of child-bearing age in central Ethiopia is high. Study area, pregnancy and raw vegetable consumption are risk factors to acquire *T.gondii* infection. Educational program, antenatal screening of pregnant women and further epidemiological studies to uncover the economic and health impact of toxoplasmosis are suggested.

Key words: *Toxoplasma gondii*, Seroprevalence, Cross-sectional, Risk factors, Central Ethiopia, ELISA.

1. Introduction

1.1. Background of the study

Toxoplasmosis is among the global major zoonotic diseases [1, 2] and the third leading cause of food-related deaths in the United States of America [USA][3].The parasite,*T.gondii*, an apicomplexa protozoan parasite [4], with cats as the definitive host and warm-blooded animals as intermediate hosts [5].It has three infective stages, tachyzoites [endozoites] and bradyzoites [xystoxites] in tissue and sporozoites in sporulated oocysts [2].Humans get infections with *T. gondii* after ingesting raw or undercooked meat, by ingesting cat-shed oocysts via contaminated soil, food or water,or congenitally by transplacental transmission of tachyzoites [1, 5-9].

There are three clonal lineages with *T.gondii*, namely Type I, Type II and III. Type I kill less than 7 days [acute virulence in mice] where as those of type II induce chronic pathology in susceptible strains of mice and type III is least virulent .In humans, type I is more frequently associated with congenital infection whereas type II is common in patients in whom disease has reactivated [10].

Congenital toxoplasmosis is a major problem in most communities with a high prevalence of *T. gondii* infection. Infection with *T. gondii* during pregnancy can result in fetal death, neonatal death or various congenital defects, such as hydrocephalus, central nervous system abnormalities and chorioretinitis [1, 9, 11]. For occurrence of congenital toxoplasmosis; the primary infection should be established during pregnancy. Among women infected by *T. gondii* during pregnancy, 61% do not transmit the disease to the fetus, 26% of the conceptions present subclinical infection [visual/or hearing deficit, neuromotor and/or learning deficit] and in 13% there is a clinical infection [hydrocephalus or microcephaly, chorioretinitis, cerebral calcification and mental retardation] [12].

Transplacental transmission of *T.gondii* occurs during the period of acute maternal infection .The rate of congenital toxoplasmosis with risk for severe fetal varies from 15 to 68%, depending on gestational age; the transmission rate is highest in the later stages of pregnancy [5-9].

Although most newborns with congenital infection show no signs of infection at birth, up to 85% of these will develop visual impairment in their lives, and 55% will present neurological disorders [10-12,].

Toxoplasmosis is also a serious problem in immunocompromised patients [7, 11]. The occurrence of toxoplasmosis has been significantly increasing due to the opportunistic infection of immunocompromised patients, such as acquired immune deficiency syndrome [AIDS]. In these people deaths usually result from rupture of cysts that lead to continued multiplication of tachyzoites. Hence encephalitis is reported to be the predominant clinical manifestation of toxoplasmosis in these AIDS patients and is believed to be due to reactivation of latent infection [3-5]. *Toxoplasma gondii* causes severe encephalitis in up to 40% of AIDS patients, and between 10 - 30% of case fatalities of the AIDS patients occur [4].Furthermore, in ocular toxoplasmosis 25% cases develop blindness [10]. Most ocular cases are now attributed to acquired toxoplasmosis, thus preventive strategies should be directed not only to pregnant women but also in the general population [13-14]

The diagnosis of toxoplasmosis can be done using a variety of methods such as indirectly with serological methods like Sabin Feldman Test [SFT], Enzyme Linked Immunosorbent Assay [ELISA], and directly by Polymerase Chain Reaction [PCR], hybridization, isolation and histology [3, 5, 9].

Serological screening for *T. gondii* antibodies should be done in women of child-bearing age as it allows identification of women at risk of acquiring infection [3] and is part of a strategic approach for prevention of congenital toxoplasmosis [13].The seroprevalence of *T.gondii* infection among women of child-bearing age, in different countries ranges from 4 to 100 % [3, 4].In Africa, prevalence rates range from 25% in Burkina Faso to 75% in Sao Tome and Principe [1].

In Ethiopia, toxoplasmosis is a neglected disease and infection in women of child-bearing age is unknown. Few studies undertaken in Ethiopia reported prevalence rates of toxoplasmosis in the general population ranging from 20.2% to 97.7% [18-21,24]. With the exception of the IgG

seroprevalence [20.2%, 19/94] report of Eshete *et al.* [24] no study has reported its prevalence in pregnant women in Ethiopia. Until the widespread use of antiretroviral drugs, toxoplasmosis is the most common disease complication, next to tuberculosis, among HIV seropositive admissions and deaths at Tikur Anbessa Teaching Hospital in Addis Ababa [40]. Therefore, the aim of the study was to estimate the seroprevalence and potential risk factors in acquiring *T. gondii* infection by women of child-bearing age in Central Ethiopia.

1.2. Statement of the problem

The importance of toxoplasmosis in food safety, human health and animal husbandry have been well recognized.The importance of toxoplasmosis is primarily in pregnant women, organ transplantation patients and immunodeficient individuals.Approximately one-third of the world's population is infected by *T.gondii* [13-14].Serological studies show a considerable variation in the prevalence of Toxoplasma infection in general population from 0-95% in different parts of the world and indeed between different population groups within the same country. This high prevalence of infection in human proves the importance toxoplasmosis as a zoonotic disease .In most adults does not cause serious illness, but it can cause blindness and mental retardation in congenitally infected children's and in immunocompromised individuals [15].

Even though a number of investigations have been carried out in many countries of the world, little is known on the epidemiology and public health importance of toxoplasmosis in Ethiopia. Particularly the importance of this disease in pregnant women is not studied in Ethiopia.In this country, the causes of most abortions, stillbirths and neonatal mortalities in human are unexplored and the relationship with seroprevalence of toxoplasmosis has not been investigated. Besides, there is habit of eating raw and/or under cooked meat, unavoidable contact between humans and domestic animals and very high prevalence of HIV/AIDS.Thus, human toxoplasmosis in Ethiopia might have strong linkage with seroprevalence of the infection in food animals.The prevalence of Toxoplasmosis in different agro ecological zone and the relative contribution of the various routes of transmission in humans in Ethiopia have not been adequately studied.

The knowledge and perception of health professionals towards to toxoplasmosis is the best tool to reduce the risk of the infection in human.In these regards, assessing the knowledge and perception of health professionals towards to toxoplasmosis in Ethiopia is very crucial but no similar study conducted in the country before.Lack of adequate studies on seroepidemological pictures, potential risk factors and knowledge and perception of health professionals towards toxoplasmosis in the country justified the importance of this study.

2. Literature Review

Study of the sero epidemiology of this infection among child-bearing age women could provide appropriate approaches to preventive measures.However; seroprevalence in human populations varies greatly among countries, geographical areas within one country and even ethnic groups living in the same geographical area [27].There have been a large number of serological surveys conducted in many countries examining the prevalence of toxoplasmosis in humans.The seroprevalence of *T. gondii* infection among women of child-bearing age, in different countries ranges from 4 to 100 % [3, 4].

In Turkey among the tested sera 1.34% of the women were IgM and 24.61% were IgG positive for *T. gondii* infection [28].In Maracaibo, the overall prevalence of toxoplasmosis was 33%, while 18.2% were positive IgM [29].In India, among 300 pregnant women anti *Toxoplasma* IgG antibodies were detected in 15.33% cases, while 3% had positive anti *Toxoplasma* IgM with IgA and/low avidity antibodies suggestive of acute infection during or just before pregnancy [30].In another study in Iran, 247 of the 553 pregnant women were found to be positive for IgG *T. gondii* antibodies and the rate of seropositivity of latent *T.gondii* infection was 44.8 % [31].

The ethnic differences are likely to be cultural and may be due to different patterns of hygiene, cat density/ownership, food preparation and socioeconomic status or other factors of note is the observation that where environmental oocysts are thought to be the major source of infection, people of lower socioeconomic status have the highest *T. gondii* antibody prevalence rates[31]

In Brazil, variables like, residence in rural areas, pregnant women between 35-40 years old, low educational level, low family income, more than one pregnancy, drinking water which does not originate from the public water supply system and the habit of handling soil or sand were associated to the presence of IgG antibodies [32].Isabelle Ribeiro in natal, showed that direct contact with cats or dogs was highly associated with toxoplasmosis [$P < 0.001$].Low socioeconomic status and limited knowledge about the disease [$P \leq 0.05$ for both] were also associated with toxoplasmosis infection [33].

In developing countries *T. gondii* infection rates are high in childhood; whereas in industrialized nations the antibody prevalence is relatively low in children, but increases gradually with age such that approximately one-half of all adults show evidence of infection [5].In the USA, the overall age-adjusted seroprevalence is 22.5%, with a seroprevalence of 15% in women aged 15–44 years. In Europe and in the USA, of the estimated 750 deaths caused by toxoplasmosis in the United States each year, 375 are thought to occur from eating raw or undercooked meat; this makes toxoplasmosis the third-leading cause of food borne death. The high prevalence of toxoplasmosis in south and central America is believed to be due to high levels of contamination of the environment with oocysts [34].

The high seropositive rate in France [up to 90%] is likely due to a cultural predilection for lightly cooked or raw meat [34]. In Brazil, 84% of the population in the lower socioeconomic group was seropositive, compared with 62% and 23% of the middle and upper socioeconomic groups, respectively [$p<0.001$][36].In Spain, low socioeconomic status was strongly associated with the presence of *T. gondii* antibody in pregnant women [37]. In Burundi *T. gondii* antibody prevalence amongst urban people of low and high socioeconomic groups was 45% and 22%, respectively. Low monthly income and living in poor housing conditions, including streets made of sand and houses with sand floors were also associated with IgG seropositivity [38].

Interestingly, a waterborne outbreak associated with kittens living on top of a municipal water reservoir in Brazil was reported [38, 39]. People with compromised immune systems due to acquired immunodeficiency syndrome [AIDS], cancer, transplant recipients receiving immunosuppressive drugs [such as corticosteroids], the elderly, very young children and fetuses are all at high risk and patients may suffer from serious health consequences due to *T. gondii* infection [40].

In Africa different reports indicate widespread occurrence of toxoplasmosis. So far limited studies have been undertaken to investigate the magnitude of *T. gondii* infection in animals and humans in Ethiopia.Few studies undertaken in Ethiopia reported prevalence rates of toxoplasmosis in the general population ranging from 20.2% to 97.7% [18-21,24]. With the exception of the IgG seroprevalence [20.2%, 19/94] report of Eshete *et al.* [24] no study has

reported its prevalence in pregnant women in Ethiopia. In the seroprevalence study of human *T. gondii* infection of workers at Addis Ababa abattoir, [20] reported a prevalence of 96.77%.

Table 1: Prevalence of *T. gondii* in Ethiopia

Study area	Prevalence [%]			Test	References
	Sheep	Goat	Human		
Different parts of Ethiopia	-	-	74.4	ELISA	Guere-Xabier et al.[1993][21]
Addis Ababa	-	-	96.77	ELISA	Yimer et al. [2005][20]
South Wollo	45.4	37.2	76.5	MAT	Yibeltal [2008] [18]

A study conducted in South Wollo area of Ethiopia indicated that the risk factor associated with seropositivity to toxoplasma infection were consumption of raw or undercooked mutton and presence of cat in the households [18].In Tikur Anbessa Teaching Hospital lymphadenopathy, encephalitis and paralysis are the most frequently encountered symptoms among HIV positive individuals visiting the hospital where toxoplasmosis is tentatively diagnosed to be an opportunistic infection [40].

Because of the asymptomatic nature of primary toxoplasmosis Infection, counseling of pregnant women is of paramount importance to reduce the risk of fetal infection. Knowledge of the most likely sources of infection in a given population is a prerequisite for the development of effective strategies to decrease, and perhaps eliminate, infection risks. Effective counseling for prevention requires knowledge of the risk factors associated with the transmission of the parasite Knowledge of the life cycle of *T. gondii* is necessary to understand how to advice women to decrease their risk of primary toxoplasmosis [41-43].

Survey of pregnant women in the USA showed that 60% of pregnant women were aware of transmission of *T. gondii* from cats, but only 30% were aware of the risk of acquiring *T. gondii* from raw or undercooked meat [43].Education of obstetricians, nurses and physician on risk factors for toxoplasmosis transmission is needed and may lower the rate of congenital

toxoplasmosis as well as decrease the frequency of cat abandonment during pregnancy.There are few studies addressing the degree of knowledge on toxoplasmosis of the health professionals.

In the few surveys carried out among obstetricians, a deficit in the knowledge about the diagnostic, clinical, and epidemiological aspects of toxoplasmosis was demonstrated, with the inherent risk of inadequate management [44]. Alvarado-Esquivel C, [45] indicated that the physicians surveyed showed an incomplete knowledge about diagnosis and treatment of toxoplasmosis.A survey showed that the vast majority of obstetricians counseled pregnant women on avoiding cat litter and undercooked or raw foods, but fewer provided counseling on safe gardening and over 50% responded that keeping a cat outdoors would lower the risk of toxoplasmosis [46].

2.1. Significance of the Study

The study together with other similar and in–depth studies will be certainly useful to quantify risks in humans, particularly in child bearing age women, essential to prioritize the problem and look for appropriate solution. In this regard the proposed study will have implication for policy makers in shaping health policy framework in the country essential for launching appropriate and specific prevention and control strategies. Therefore, this research project will partly address the problem.

Ethiopia is also among the countries in Africa and elsewhere in the world most severely affected by the HIV/AIDS pandemic. Abortion and neonates borne with congenital abnormalities adds significant economic and social burden to the country. *T.gondii* is one of the opportunistic infections leading to encephalitis and death in up to 30% of HIV/AIDS patients. Toxoplasmosis ranks among the 10 most commonly occurring opportunistic infections and malignancies in AIDS patients, and may well be a greater direct cause of morbidity and mortality than other more common opportunistic infections.

Therefore, determination of epidemiological picture of *T. gondii* in people [seroprevalence and risk factors] gives data about the magnitude or extent of the problem in the environment and is of considerable importance in devising and launching appropriate and specific preventive and control measures for toxoplasmosis.

The data generated may be of considerable value to clinicians in the management of congenital toxoplasmosis in pregnant women .Since toxoplasmosis is one of poorly diagnosed, and probably not considered as a potential health problem, samples may not be processed in the laboratory test as well. Therefore, determining the magnitude of the disease in the risk group of human population will help physicians to consider toxoplasmosis during diagnosis and management of the disease. The study also helps for generation of baseline data on this important protozoan pathogen of immense medical and veterinary importance that also enhance the future surveillance activities in the country.

The outcome of the research work is generally expected to benefit human beings living in the study area in particular and the country at large. The project is expected also to child bearing age women in particular and the community at large. Governmental and non-governmental organizations working in the area of policy issue, congenital diseases and zoonotic disease prevention and control may utilize the information generated. The Ministry of health may utilize the information generated in designing appropriate policies and control strategies. The data will be indispensable for local government and non-governmental organizations, researchers and students.

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3. Objectives

3.1. General Objective

- To determine the seroprevalence and potential risk factors in acquiring *T.gondii* infection by women of child-bearing age in central Ethiopia.

3.2. Specific objectives

- To determine the overall prevalence of *T.gondii* infection among women of child-bearing age in central Ethiopia.
- To estimate the seroprevalence of recent *T.gondii* infection [Toxo-IgM] in pregnant women's of central Ethiopia
- To identify risk factors associated with *T.gondii* infection in women of child-bearing age of central Ethiopia.
- To assess the knowledge and perception of health professionals working in antenatal care in selected health institution of central Ethiopia.
- To assess the general awareness of child bearing age women about toxoplasmosis.

4. Material and Methods

4.1. Study setting

This study was conducted in Addis Ababa, Ambo, Debre-zeit and Metehara towns of central Ethiopia.

Addis Ababa [longitude 38°44′, to 39°55′ E and latitude 9°48′ N], the capital city of Ethiopia, is characterized by a biannual rainfall with a mean annual of about 950 mm.The average monthly minimum and maximum temperature ranges from 2.5°C to 8.4°C and 17.6°C to 22.5°C, respectively [47].

Ambo [longitude 37° 32' to 38° 3' E and latitude 80° 47' to 90° 20' N] is the capital of West Shoa Zone of the Oromia Regional State. The altitude ranges from 1400 to 3045 meter above sea level [masl].The annual rainfall and temperature range from 800 to 1000 mm and 15 °C to 29 °C, respectively [48].

Debre-Zeit [longitude 38°38'E, latitude 08° 44' N] and Metehara [longitude 36° 23'to 39°54'E and latitude 8°54’ N] are the capitals of Adea and Fentale districts, respectively, and are located in East Shoa Zone with in a distance of 190 kms from Addis Ababa. The altitude of Adea and Fentale districts range from 1500 to over 2000 and 955 to 2007 masl, respectively. The average rainfall and average temperatures of Adea and Fentale districts are about 839 mm and 553 mm and 7.9 ºC to 28 ºC and 29 to 38 0C, respectively. Fentale district has arid and semi-arid climates [49].

The human population of the study areas is summarized in Table 2.The data are based on summary and stastical report of the 2007 population and housing census results [CSA, 2008a].

Table 2:Summary of human population in selected towns of central Ethiopia [Source: CSA, 2008a]

Study Areas	Human Population	Child-bearing Aged women
Addis Ababa	2,738,248	948,784
Ambo District	121,261	42,441
Debre-zite District	118,259	40,390
Methara District	82,225	28,778

4.2. Study Design and Period

A cross-sectional study was conducted at selected health facilities in central Ethiopia from May 2011 to January 2012.

4.3. Source population

The source population for seroprevalence and risk factor assessment were all patients who are visiting the health institution for follow up of antenatal care services or medication. The source populations for knowledge and perception study were all health professionals who are working in selected health facilities of central Ethiopia.

4.4. Study Population

The study populations were child bearing age women [pregnant and non pregnant] who are visiting the selected health institution for fellow up of antenatal care services or medication. The

study subjects for knowledge and perception study were all health professionals who are physician, nurses and gynecologist.

4.5. Sampling Method and Procedure

Study sites were selected from those health facilities based on patient flow, geographical proximity and willingness of health professionals for study. From those, study sites were selected by simple random sampling [SRS] from all study areas eight health facilities included to the study.The study sites were includes Ambo hospital, Ambo health center, Bisheftu Hospital, Bisheftu health center, Merti Hospital, Methara health center and Kebena health center. Pregnant and non pregnant women who are visited those health facilities, voluntary and give their consent to participate were included in the study. All health professionals who are physician, nurses and gynecologist and work at antenatal service of the selected health facilities were included in the study.

4.6. Sample size determination

4.6.1. Sample size determination for seroprevalence study in child bearing age women

In the current study, convince sampling and single population proportion method was used. The sample size required was calculated using the formula given by Thrusfield [50]. According to Guebre-xabier *et al*. 1993[21], the prevalence of *T.gondii* infection in different parts of Ethiopia was 74.4%.

$$N = \frac{[Z\alpha/2]^2 * P* [1-P]}{[d]^2}$$

Where, N = minimum sample size

$Z\alpha/2$=1.96 at 95% confidence interval [CI]

P = Expected prevalence

d = desired absolute precision or margin of error 0.05 at 95% CI

N=[1.96]² * 0.74 *[1-0.74] divided by [0.05]²,

N=293

To take account of non-response rate and geographical clustering of the target population the sample size was inflated by 45% to increase the precision of the study. Therefore, a projected sample size of 425 child bearing women population was used to collect sera samples. The calculated sample size was distributed to all study areas using a proportional allocation [Table 3] based on the annual patient flow to the respective selected health institution and women were conviencly selected in each study areas.

Table 3.Patient flow and sample size distribution among selected health institutions of the Central Ethiopia

Study area	Patients / women flow per year	Proportional sample
Addis Ababa	639	150
Debrezeit	520	122
Ambo	401	93
Metehara	255	60
Total	1815	425

4.6.2. Sample size determination for knowledge and perception study of health professional

Since similar study sites were used for seroprevalence, risk factor assessment and knowledge and perception study and the prevalence not specifically known for knowledge and perception, we use 50% to calculate the sample size, so the sample size was:

$$N = \frac{[Z\alpha/2]^2 * P* [1-P]}{[d]^2}$$

Where, N = minimum sample size

Zα/2=1.96 at 95% confidence interval [CI]

P = Expected prevalence

d = desired absolute precision or margin of error 0.05 at 95% CI

N= $[1.96]^2 * [1-0.5] * [0.5]$ divided by $[0.05]^2$

N=384 with 10 % contingency N=422

However the calculated sample size or determined number of health professionals was not found in selected health facilities. Therefore purposive sampling method, i.e.all health professionals [physician, nurses and gynecologist] of the selected health facilities, was used for knowledge and perception study.Generally 100 health professionals were included in the study.

4.7. Patients inclusion and exclusion criteria

Inclusion and exclusion criteria for seroprevalence study: All Pregnant and non pregnant women who were visiting health facilities for medication were included in the study. All patients except child bearing age women were excluded.

Inclusion and exclusion criteria for knowledge and perception study: Those health professionals who are physician, nurses and gynecologist and had more than or equal to two years work experience were included in the study but others health professionals except the aforementioned health professionals and had less than two years work experience were excluded.

4.8. Study Variables

Dependent variable for seroeprevalence and knowledge and perception study: result of seroprevalence of *T.gondii* infection and knowledge and perception of health professionals.

Independent variables for seroprevalence study: were age, pregnancy status, stage of pregnancy,abortion,socioeconomic status, level of education, presence of cat at home, contact /play with cat, exposure to cat faces, feeding habits, source of water, exposure to soil and awareness of toxoplasmosis.

Independent variables for knowledge and perception study: were Age, sex, educational status, work experience, case of *T.gondii* infection, sign and symptoms, lab diagnosis, modes of transmission, prevention and control measures, public importance of toxoplasmosis and medication.

4.9. Data collection

4.9.1. Questionnaire survey for risk factor assessment in childbearing age women

Onsite training was given for interviewers and supervisors for two days. Crosschecking was conducted in sample facilities for consistency.The data and sample collectors were physician, health officers, nurses and lab technologists.

A pretested, structured questionnaire was used to assess demographic, socioeconomic, and behavioral variables of each child bearing age women. Prior to the administration of the questionnaire the study subjects were brief on the objectives of the study.The questionnaire also translated into Amharic Version.Verbal consent was obtained from each respondent. Questionnaires includes variables like age, feeding habits of respondents, residential area, house floor type and made, socioeconomic variables, pregnancy status, number of pregnancy, stage of pregnancy, history of abortion, cat in their households and contact with them; source of drinking water, awareness about toxoplasmosis and HIV status [predetermined], education level, occupation and abortion history. These variables were selected based on literature.

4.9.2. Questionnaire survey for knowledge and perception study

A questionnaire-based survey on knowledge and perception of health professionals about Toxoplasmosis was conducted at selected health facilities of different parts of central Ethiopia of May 2011 to January 2012.A structure and pretested questionnaire used to collect data. For the health professionals the designed questionnaires includes variables like age, sex, Educational status, professions,work experiences, awareness of toxoplasmosis, exposure of toxoplasmosis case on the patient, clinical sign and symptoms, prevalence of case,Medication and provision of health education to pregnant women.

4.9.3. Blood sample collection and transportation

Blood samples [5 ml] were collected from child bearing age women by using sterile plain vacationer tubes [BD Vacutainer systems, Polymouth, UK] consecutively from pregnant women and HIV infected patient enrolled in the study period. The blood samples were left at room temperature to allow clotting and centrifuged at 3000 rpm for 10 minute. Then sera were collected into 2 ml Eppendrof tubes [Eppendrof-AG, Hamburg, Germany], and stored at - 4°C for 48-78 hours at sampling sites. At the time of sample collection structured questionnaire used to collect data such as Age ,pregnancy status, history of abortion, trend of consuming raw meat, vegetables and milk, and source of water.

Serum samples transported according to standard that is the container sealed and packaged, labeled and transported in ice box to the Microbiology laboratory of the Addis Ababa University and kept at -20°C until tested.

4.10. Laboratory Investigation

4.10.1. Indirect ELISA IgG and IgM Test

All sera collected from child bearing age women were tested using a commercial indirect human TOXO IgG and IgM µ-capture ELISA kit [Human biochemical and diagnostic company-Germany] for the presence of anti *T.gondii* IgG and IgM antibodies following the manufacturer's

instructions. The kit has reported sensitivity and specificity of 98% and 99%, respectively. The indirect ELISA IgG uses the antigen of *T.gondii* [Tachyzoites] to detect the IgG and Toxo IgM ELISA KIT uses anti-human IgM antibodies (mouse).The ELISA assay was conducted according to instruction of the manufacturer. Details of the kit and the test protocol were indicated in Annex VII.

Briefly, 100µl of the sera [calibrators and samples] at the dilution of 1:10 were dispensed in a micro titer plate coated with whole coated particles.Micro plate was incubated for 1hour at 37°C for IgM and 30 minute at 17—25oc for IgG and washed four times, then, 100 µl anti G-protein peroxidase conjugate [diluted 1:100 in ELISA buffer] was added and a plate incubated again for 30 minutes at 37°C [± 3°C]. Finally, 100 µl peroxidase substrate added to each well. After incubation at room temperature for 30 minutes for IgM and 30 minute at 17—25oc for IgG .Then l00 µl of substrate is added for both assay based on the afromentioned time and temperature excep 15 min in the case of IgG assay. In darkness, the reaction was stopped with 100µl stop solution. The optical density [OD] of each well measured using a photometer at a wavelength of 450 nm.

Based on the accepted criteria mentioned at Annex VII for both assays the result is interpreted as reactive or nonreactive fo IgM or IgG antibodies against *T.gondii* .

4.11. Quality assurance mechanisms

One of the areas to look into quality assurance of these research findings were based on whether proposed standard current techniques used internationally for the sero-epidemiological study [using ELISA and questionnaires].For example, the ELISA kit which had highest sensitivity and specificity with universally accepted protocol was used to identify seropositive child bearing age women.

The other important part of the study is questionnaire survey based investigations to assess various risk factors to acquire *T.gondii* infection in women and associated reproductive health problems and knowledge and perception of health professionals.For this purpose pretested

questionnaire in one selected site using 15-20 respondents was analyzed and usefulness of the data for the survey was assessed before it's finally usage for the actual research purpose.The questionnaire also translated to Amharic Version.

4.12. Data management and analysis

The data was recorded and coded in Microsoft Excel spreadsheets [Microsoft Corporation] before transferred to statically software for analysis [STATA Version 20, Stata cooperation, TX, USA].The database included serological test result and questionnaire responses. The seroprevalence was calculated as the number of serologically positive samples divided by the total number of samples tested. Chi square $\mathbf{[}_{X}{}^{2}\mathbf{]}$ was applied to determine existence of any association between seropostivity and the potential risk factors. A logistic regression model was employed to assess the predictive values of the potential risk factors.The Chi-square test was used to determine associations between seropositivity and potential risk factors. The strength of the associations was assessed by odds ratios and 95% confidence intervals [CI] were calculated. Variables that showed collinearity and low frequency were not offered to final model. Results were considered significant at $P \leq 0.05$.For knowledge and perception section frequency table were computed and Chi square $\mathbf{[}_{X}{}^{2}\mathbf{]}$ was applied.

4.13. Ethical Consideration

Ethical approval was obtained from Addis Ababa University, Collage of Health Sciences, School of Medical Laboratory Sciences with protocol number of DRERC 001/11/MLS.During data collection all study subjects were informed about the study and written informed consents were obtained from child bearing age women. Confidentiality was assured by using codes.At the end of the study, those pregnant women and non pregnant women who develop recent *T.gondii* infection will be informed for the concerned body for appropriate intervention and treatment.

4.14. Dissemination of results

The findings of this study will be presented to staff of School of Allied sciences, department of clinical laboratory sciences and the result will be disseminated to the respective administrative zone in the study area. The finding will also disseminated to different organization who are working on maternal health, newborn health, PMTCT area, congenital disease, and policy issues. The findings will present in different seminars and workshops to disseminate and submitted to journal for publication.

5. Results

5.1 Seroprevalence study

5.1.1. Socio-demographic characteristics of child-bearing age women

In the current study, a total of 425 sera [213 pregnant women and 212 non pregnant women] from Addis Ababa, Debrezite, Ambo and Methara were included. Total number of blood samples taken from Addis Ababa was 150.Similarly 122 from Debre-zite, 94 from Ambo and 59 from Methara.

The mean age of the child bearing age women was 22.9 ± 5.21.Most of the child-bearing age women fell in the age range between 15-20 years. Most of child bearing age women, 71.7% [305], were from urban areas. Among child bearing age women, 29.4% [125] were employed in different organization. Most of the study participants had low monthly income 83.9% [356], or found in poor socioeconomic status, 66.6% [283] of the child bearing age women were orthodox, 19.2% [81] had no education or illiterate and 63.5% [270] were married.

Table 4:Socio-demographic characteristics of child bearing age women of Central Ethiopia, February 2012.

Variables	Frequency	Percent [%]
Study areas		
Addis Ababa	150	35.3
Debrezite	122	28.7
Ambo	94	22.1
Methara	59	13.9
Age		
15-20	180	42.3
21-25	130	30.5
26-49	115	27.2
Religion		
Orthodox	283	66.6
Protestant	65	15.3
Muslim	77	18.1
Residential place		
Urban	305	71.7
Rural	120	28.3
Educational status		
Tertiary	67	15.7
Secondary	115	27
Primary	162	38.1
Illiterate	81	19.2

Employment status		
Employed	125	29.4
Unemployed	300	70.6
Occupation type		
NGO	60	48
Gov	42	33.6
Farming	5	4
Others	14	11.2
Monthly income		
High level [>1500]	33	7.7
Medium level [501-1500]	36	8.4
Low level [<500]	356	83.9
Marital Status		
Married	270	63.5
Unmarried	155	36.5

5.1.2. None socio-demographic characteristics of child bearing age women

From the child bearing age women, 37% [157] of them living in soil made house with soil floor of 40.8% [173].Almost 50.1% [213] of child bearing age women were pregnant women and 49.9 % [212] were non pregnant women.Most of child bearing age women 88.4% [190] had one child.In the current study, among pregnant women 21.1% [45], 49.7% [106] and 29.2% [62] had first,second and third trimester respectively.Around 20.5% [87] of the child bearing age women had an exposure of accidental abortion.Among child bearing age women, one hundred twelve [26.4%] of them are HIV infected [Table 5].

From the child bearing age women, 60.7% [258] of them had cat at their home, 60% [255] had contact or play with cat and 55.8% [193] exposed to cat feces. Only 1.8% [5] of study participants had separate kennel or house for their cat and, 74.1% [196] of them dispose cats feces on to open garden, 99.6% [236] had no precaution during cleaning of cat feces.

Regarding to the feeding habit of study participants, 41.7% [177], 59.8% [254] and 14.4 %[61] had an experience of consuming raw meat, raw vegetables and raw milk. From study participants 18.6 % [79] of them used unboiled river and well water and 81.4% [346] municipal tap water are used for drinking purpose.

Almost all study participants had no awareness or information regarding health risk of cats, sign and symptoms and health disorders of toxoplasmosis, modes of transmission and importance of testing for toxoplasmosis during pregnancy.In the current study,the awareness and knowledge of Pregnant women's about toxoplasmosis is poor.

Table 5: None sociodemographic characteristics of child bearing age women in central Ethiopia, February 2012.

Variables	Frequency	Percentage [%]
House Made		
Brick	268	63
Soil	157	37
House floor		
Cemented	252	59.2
Soil	173	40.8
Pregnancy status		
Non pregnant	212	49.9
Pregnant	213	50.1
Number of pregnancy		
One	190	88.4
More than one	25	11.6
Stage of Pregnancy		
First trimester	45	21.1
Second trimester	106	49.7
Third trimester	62	29.2
Mental/eye damage		
No	220	51.7
Yes	205	48.3
History of abortion		
No	338	79.5
Yes	87	20.5
Cat at home		
No	167	39.3
Yes	258	60.7
Contact/playing with cat	170	40
No	255	60
Yes		
Exposure to cats feces	153	44.2
No	193	55.8
Yes		

Disposal of cat feces		
Latrine	58	21.8
Burial	11	4.1
Open garden	196	74.1
Precaution during cleaning		
Precaution	29	0.4
No precaution	236	99.6
Separate cat house		
No	261	98.2
Yes	5	1.8
Raw meat consumption		
No	248	58.3
Yes	177	41.7
Wash hands after handling raw meat		
No	36	8.4
Yes	389	91.6
Raw vegetables consumption		
No	171	40.2
Yes	254	59.8
Wash vegetables before consumption		
No	259	99.2
Yes	2	0.8
Raw milk consumption	364	85.6
No	61	14.4
Yes		
Source of water		
Municipal Tap water	346	81.4
Untreated river and well water	79	18.6
Exposure with soil		
No	105	24.7
Yes	320	75.3
Awareness that cat have health risk to human		
No	424	99.8
Yes	1	0.2

5.1.3. Seroprevalence of *T.gondii* infection

During the study, the overall IgG and IgM *T.gondii* seropositivity were 81.4 % [346/425] [95% CI: 77.70, 85.13] and 20.5% [87/425] [95% CI: 16.62, 24.32], respectively .The agreement in the reactivity to IgG and IgM was non-significant [kappa = -0.134; P-value =1.00].

Most of ,69.4%, the women were IgG reactive and IgM non-reactive; 12% were both IgG and IgM reactive; 8.5% IgG non-reactive and IgM reactive and 10.1% were both IgG and IgM non-reactive [Table 6].Among tested sera, 20.5 % [87/425] [95%CI: 16.62,24.32] were positive for anti-*T.gondii* IgM antibodies suggestive of recent infection. Among positive for anti-*T.gondii* IgM antibodies, 7.1% [30] were non-pregnant and 13.4% [57] were pregnant.

Out of 425 tested women 213 were pregnant and 86.38% [184] of the pregnant and 76.42% [162] of the non pregnant women were positive for anti-*T.gondii* IgG antibodies.Among IgM positive pregnant women, the prevalence of IgM antibody increased with the duration of pregnancy but that of IgG was relatively higher in second trimester [Figure 2].

The *Toxoplasma* IgG positive and lgM negative results [10.1%, 43/425] suggest past exposure to the parasite or old infection.Among the pregnant women of the study 26 [12.2%] were IgG negative and IgM positive and 31 [14.6%] were both IgG and IgM positive, which means 26.8 % of the women had detectable IgM antibodies during pregnancy .From table 6, it can be observed that the majority of the study population had pre-existing infection with the parasite [69.4%]. Around 10.1% [seronegative] of the study population is at risk of acquiring the infection in the future.

Table 6: Combined IgG and IgM anti-*T. gondii* antibodies seroprevalence in child bearing age women of Central Ethiopia, February 2012.

Sero reaction	Total [N=425]		Pregnant [N=425]		Non-pregnant[N=425]		P-value
	Positive	%	Positive	%	Positive	%	
IgG Positive only	295	69.4	153	71.8	142	67.0	0.283
IgG and IgM Positive	51	12.0	31	14.6	20	9.4	0.099
IgG and IgM Negative	43	10.1	3	1.4	40	18.9	<0.001
IgG negative and IgM positive	36	8.5	26	12.2	10	4.7	0.006
Total seropositivity	346	81.4	184	86.4	162	76.4	0.008
Total seronegativity	79	18.6	29	13.6	50	23.6	0.008

In the present study, *T. gondii* infection seroprevalence is highest in Debrezeit followed by Metehara. The prevalence of toxoplasmosis [IgG] in child bearing age women in the study areas were 92.6 % in Debrezeit, 90 % in Metehara,76.7 % in Addis Ababa and 68.9 % in Ambo. Here, the seroprevalence was stastically different [P<0.05] among the study areas. There was significant variability in IgG and IgM seroprevalence of toxoplasmosis in different study areas **[**Figure 1].

The IgG seroprevalence of toxoplasmosis in Debrezite is six times higher than the seropostivity in Ambo. In the present study, *T.gondii* IgM seroprevalence is highest in Methara followed by Ambo. However the *T.gondii* IgM seroprevalence is the same in Addis Ababa and Debrezite.

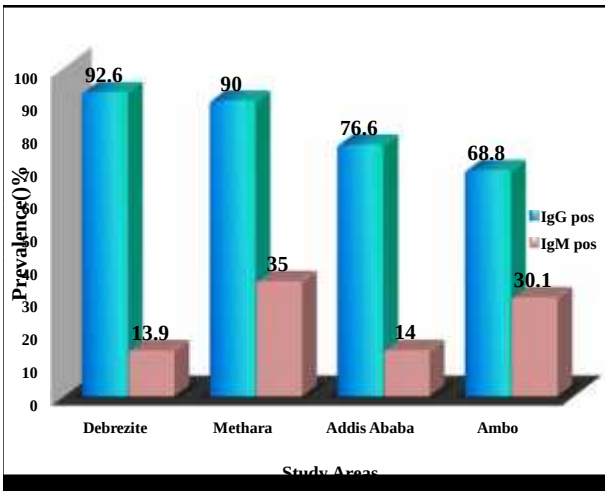

Figure 1:*T.gondii* IgG and IgM seroprevalence in child bearing age women of Central Ethiopia, February 2012.

5.1.4. Risk factors associated with *T.gondii* seropostivity

Information was collected from pregnant women and non pregnant women for some risk factors and sociodemographic variables that are potentially associated with toxoplasmosis using questionnaire. According to several studies on different countries the possible risk factors for

T.gondii infection were age, socioeconomic status, educational status, consumption of raw food substances [meat, milk and vegetables], cat at home, contact with cat faces, source of water and abortion. The indirect ELISA anti-*T.gondii* IgG and IgM test result of serum samples were analyzed together with these potential risk factors.

A comparison of epidemiological risk factors to acquire *T. gondii* between seroreactive and non reactive study participants was done using logistic regression analysis. During the stastical analysis, in all risk factors, the first level of each independent variable was used as reference categories. The results of seroprevalence of *T. gondii* infection along with associated risk factors and the difference between seroprevalence of toxoplasmosis per each risk factors categories as well as association are summarized in table 7-11.

Univariate logistic regression analysis showed that study area, age, HIV status , pregnancy status consumption of raw vegetables, source of water, presence of cat [s] at home, contact with cats, precautions during cats' feces cleaning, were significantly associated with *T gondii* seropositivity [P<0.05] [Table 7-11]. Univariate analysis of IgM seropositivity with pregnancy status showed that pregnant women were 2.22 times [95% CI: 1.16, 3.62; P=0.001] more likely to be IgM positive compared to non-pregnant women.

5.1.4.1. Socio-demographic variables

In the current study, an attempt was made to correlate seropostivity of *T.gondii* infection with sociodemographic variables like, age, religion, residential places, employment and educational status.

The association of age with seropostivity of *T.gondii* infection was also assessed. The univariable logistic regression model showed that there was statistically significant difference [P=0.001] among different age categories. According to this study, an increase in sero prevalence with age was observed as age increases. The probability of acquiring toxoplasmosis among those women aged ≥ 26 years is more than three times higher when compared with 15- 20 years age group [95% CI of OR: 1.70 ,6.95; P=0.001] [Table 7]

Table 7: Univariate logistic regression analysis of the association of socio demographic variables with *T. gondii* seropositivity in child bearing age women of Central Ethiopia, February 2012.

Variable	Category	IgG+/total [%]	OR[95% CI]	P-value
Study Areas	Ambo	64/93 [68.8]	-	-
	Addis Ababa	15/150 [76.7]	1.49 [0.83-2.66]	0.060
	Metehara	54/60 [90.0]	4.08 [1.58-10.55]	0.078
	Debre-Zeit	113/122 [92.6]	5.69 [2.54-12.77]	0.003*
Age	15 – 20	132/180 [73.3]	-	
	21 – 25	110/130 [84.6]	2.0 [1.12 -3.57]	0.019*
	≥26	104/115 [90.4]	3.4 [1.70-6.95]	0.001*
Religion	Orthodox	226/283 [79.9]	-	-
	Muslim	70/77 [90.9]	2.52 [1.10 -5.78]	0.029
	Protestant	50/65 [76.9]	1.19 [0.62 -2.27]	0.599
Residential place	Urban	244/305 [80.0]	-	-
	Rural	102/120 [85.0]	1.42 [0.80 -2.52]	0.235
Educational status	Tertiary	54/67 [80.6]	-	-
	Secondary	90/115 [78.3]	1.15 [0.55- 2.44]	0.709
	Primary	130/162 [80.3]	1.02 [0.50 -2.10]	0.952
	Illiterate	72/81 [89.0]	1.93 [0.77-4.83]	0.163

*-Shows that significance difference occur

Comparison of seroprevalence in child bearing age women of urban and rural areas revealed that the risk of *T.gondii* infection in child bearing age women residing in rural area was higher 85 % [102] than those living in urban areas 80% [244] [95%CI: 0.80, 2.52][P=0.23].

The risk of developing *T. gondii* infection by illiterate women populations was nearly twice when compared with tertiary level of education [95%CI: 0.77,4.83].Level of education have no statistical association with the prevalence of *T. gondii* infection [P>0.05].

5.1.4.2. Hosts related risk factors

Comparison was undertaken on the seroprevalence of toxoplasmosis on the host related factors like HIV status, pregnancy status, stage of pregnancy, number of pregnancy and abortion.

Out of 112 HIV [Predetermined] infected patients 88.4 % [99] were positive for anti-*T. gondii* IgG .The prevalence of IgG antibodies against *T.gondii* infection was higher in HIV infected patients [88.4%] than HIV uninfected patients [78.9%] [95% CI: 1.07-3.85]. According to the current study HIV status of study population shows statistical association [P=0.029] with seroprevalence of *T.gondii* infection.

In the current study, among tested child bearing aged women, pregnant women had high sero prevalence 86.4% [184/213] relative to non pregnant women 76.4 % [162/212]. Serprevalence of *T.gondii* is stastically significant with pregnancy status [P=0.009].Out of tested pregnant women, 14.15 % were IgM positives. Among IgM positives 17.78 % were in first trimester, 24.53 % were in second trimester and 34.38 % in third trimester [Figure.2].

According to the current study the presence of recent toxoplasmosis infection or the presence of IgM antibody increases as the period of trimester increases. High latent *T.gondii* infection was observed in 1st and 2nd trimester of pregnancy in the current study.

Since toxoplasmosis is an important cause of abortion in women population, an attempt was made to correlate a previous history of abortion and age of fetus aborted with seropostivity. The prevalence of toxoplasmosis in child bearing age women that experienced abortion [86.2 %] was higher than those who did not [80.2 %].But this difference was not found to be stastically significant. Similarly, no significant difference [p>0.05] in *T.gondii* seroprevalence was seen between those who aborted during first [86.7%], second [88.7%] and third [79.7%] trimester of pregnancy [Table 8].

Women populations live with high exposure of mental and eye damage there is high prevalence of *T.gondii* [84.4%] than in the area where there is no occurrence of eye or mental damage in their family [78.6%].

Generally the univariate logistic analysis of host related factors showed that variables like HIV/AIDS status and pregnancy status, had stastically significant association with the seropostivity of *T.gondii* infection.

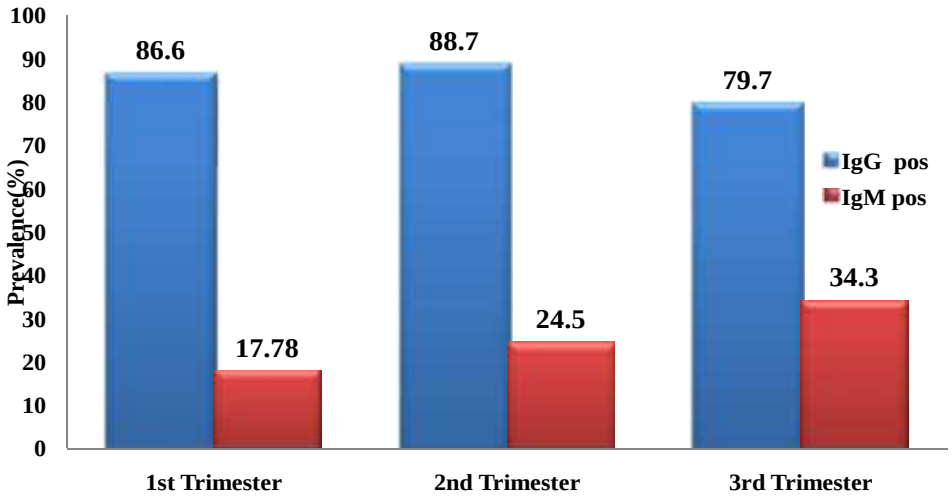

Figure.2: The prevalence of *Toxoplasma gondii* infection verses stage of pregnancy in child bearing age women of Central Ethiopia, February 2012.

Table 8: Univariate logistic regression analysis of the association of host related risk factors with *T. gondii* seropositivity in child-bearing age of Central Ethiopia, February 2012.

Variable	Category	IgG+/total [%]	OR[95% CI]	P-value
HIV/AIDS status	Negative	247/313 [78.9]	-	-
	Positive	99/112 [88.4]	2.03 [1.07 – 3.85]	0.029*
Marital status	Unmarried	125/155 [80.7]	-	-
	Married	221/270 [81.9]	1.08 [0.65 – 1.79]	0.758
Pregnancy status	No	162/212 [76.4]	-	-
	Yes	184/213 [86.4]	1.96 [1.18 – 3.24]	0.009*
No of pregnancy	One	163/190 [85.8]	-	-
	More than one	21/25 [84.0]	1.15 [0.37 – 3.61]	0.811
Stage of pregnancy	First trim	39/45 [86.7]	-	-
	Second trim	94/106 [88.7]	1.21 [0.42 – 3.44]	0.727
	Third trim	51/62 [79.7]	1.66 [1.37 – 4.75]	0.347
History of abortion	No	271/338 [80.2]	-	-
	Yes	75/87 [86.2]	1.55 [0.79 – 3.00]	0.200
Mental and eye damage in family	No	173/220 [78.6]	-	-
	Yes	173/205 [84.4]	1.47 [0.89 – 2.41]	0.129

*-Shows that significance difference occur

5. 1.4.3. Socio economic variables

Comparastion between the socioecomic status and seropostivity of *T.gondii* infection was made. Interestingly, in the current study, it is confirmed that people who are lived in soil made type house with soil floor had high seropostivity [85%] relative to those people who are lived in brick made house [79%] [Table.9].

According to this study, those study participants whose work is based on farming had high risk of developing *T.gondii* infection compared to those who have none farming associated work [P=0.37].

Table 9.Univariate logistic regression analysis of the association of socio economic variables with *T.gondii* seropositivity in child bearing age women Central Ethiopia, February 2012.

Variable	Category	IgG+/total [%]	OR[95% CI]	P-value
House made	Brick/cement	216/268 [80.6]	-	-
	Soil	130/157 [82.80	1.16 [0.69 – 1.94]	0.573
House floor	Cemented	199/252 [79]	-	-
	Soil	147/173 [85]	1.51 [0.90 – 2.52]	0.120
Employment status	Employed	101/125 [80.8]	-	-
	unemployed	245/300 [81.7]	1.06 [0.62 – 1.80]	0.834
Occupation	NGO	54/64 [84.4]	-	-
	Government	36/48 [75.0]	1.80 [0.70 – 6.60]	0.220
	Farming	4/5 [80.0]	1.35 [0.14 – 13.37]	0.798
	Other	11/14 [78.6]	1.47 [0.35 – 6.24]	0.599
	No work	241/294 [82.0]	1.19 [0.57 – 2.48]	0.648
Monthly income	High [>1001]	27/33 [81.8]	-	-
	Medium[501-1000]	28/36 [77.8]	1.29 [0.39 – 4.20]	0.677
	Low [≤500]	291/356 [81.7]	1.00 [0.40 – 2.53]	0.991

5.1.4.4. Feeding habits and hygienic condition

An attempt was made to compare the seroprevalence difference with regards to feeding habit and hygienic condition.

Table 10:Univariate logistic regression analysis of the association of feeding habit and hygieniccondition with *T.gondii* seropositivity in child bearing age women of Central Ethiopia, February 2012.

Variable	Category	IgG+/total [%]	OR [95% CI]	P-value
Raw meat consumption	No	204/248 [82.3]	-	-
	Yes	142/177 [80.2]	1.14 [0.70 – 1.87]	0.596
Wash hands after handling raw meat	Yes	319/389 [82.0]	-	-
	N0	27/36 [75.0]	1.52 [0.68 – 3.37]	0.304
Raw Vegetables consumption	No	150/171 [87.7]	-	-
	Yes	196/254 [77.2]	2.11 [1.23 – 3.64]	0.007*
Interval of raw vegetable consumption	Rarely	143/189 [75.7]	-	-
	At least once/wk	55/67 [82.1]	1.50 [0.73 – 2.99]	0.282
Wash Vegetables before consumption	Yes	1 / 2 [50.0]	-	-
	No	201/259 [77.6]	3.47 [0.21 – 56.26]	0.38
Raw milk consumption	No	298/364 [81.9]	-	-
	Yes	48/61 [78.7]	1.22 [0.63 – 2.39]	0.555
Source of water	Unboiled tap	160/212 [75.5]	-	-
	UnboiledW& R	186/213 [87.3]	2.24 [1.34 – 3.73]	0.002*
Exposure with soil	No	86/105 [81.9]	-	-
	Yes	260/320 [81.3]	1.05 [0.59 – 1.85]	0.881
Exposure to soil during	Garden	42/50 [84.0]	-	-
	Town house	199/242 [82.2]	1.13 [0.50 – 2.59]	0.764
	Farming	19/28 [67.9]	2.49 [0.83 – 7.44]	0.103
Hand washing after soil handling	Yes	3/5 [60.0]	-	-
	No	343/420 [81.7]	2.97 [0.49 – 18.03]	0.238

*-Shows that significance difference occur

The risk of acquiring *T.gondii* infection was high in those child bearing age women who don't wash vegetables 77.6%[201] than who didn't[50%] [95%CI of 0.21,56.26].Neither consumption of raw/undercooked meat nor consumption of raw milk was identified as risk factor to acquire toxoplasmosis. Women who consume raw vegetable were twice more likely to acquire *T gondii* infection when compared with those who didn't consume raw vegetables [P=0.007].
Seropostivity was also significantly higher in those groups who used unboiled river and well water for drinking purpose [87.3%] than who used unboiled tap municipal water sources [75.5%][OR=2.24; 95%CI: 1.34- 3.73, P=0.002].

5.1.4.5. Cats and its faces

Presence of cats in the women household is supposed to have great association with the epidemiology of Toxoplasmosis, as they are definite host for this parasite and the only species that shed the oocysts.

In the current study there was significantly higher seroprevalence of toxoplasmosis in households where cat[s] is/are present [84.9%][OR=1.77; 95% CI: 1.08-2.89] [P=0.023] than in the absence of cat[s] [76.1%].

The presence of *T.gondii* infection was significantly higher in those who petted or played with cat [84.7%] than who didn't [76.5%] or the risk of toxoplasmosis in presence of cat is two times greater than in their absence. Precaution during cat faces cleaning also had significant stastically association with seropostivity of *T.gondii* infection [P=0.000].

Almost all of child-bearing age women had no separate house or kennel for their cats. The risk of getting *T.gondii* infection was higher in those households who do not have separate cat kennels [82.1%] than who had separate cat kennel [80%] for the cat. Interestingly, seropostivity had strong stastical association [P=0.001] with separate cat kennels. None of the cats owned by the interviewed people were properly managed.

Table 11: Univariate logistic regression analysis of the association of cat with *T. gondii* seropositivity in child bearing age women of Central Ethiopia, February 2012.

Variable	Catagory	IgG +/total [%]	OR [95% CI]	P-value
Cats at home	No	127/167 [76.1]	-	-
	Yes	219/258 [84.9]	1.77 [1.08 – 2.89]	0.023*
Contact/playing with cat	No	130/170 [76.5]	-	-
	Yes	216/255 [84.7]	1.70 [1.04 – 2.79]	0.034*
Exposure to cats feces	No	153/199 [76.9]	-	-
	Yes	193/226 [85.4]	1.76 [1.07 – 2.88]	0.025*
Separate cat house/ kennel?	Yes	4/5 [80.0]	-	-
	No	261/318 [82.1]	1.15 [0.13 – 10.43]	0.905
Ur Precautions during cleaning?	Yes	120/129 [93.0]	-	-
	No	104/136 [76.5]	4.10 [1.87 – 8.99]	0.000*
Disposal of cat feces	Latrine	50/58 [86.2]	-	-
	Burial	7/11 [63.6]	3.57 [0.85 – 15.03]	0.083
	Open garden	167/196 [85.2]	1.09 [0.47 – 2.52]	0.849

*-Shows that significance difference occur

5.1.5. Multivariate logistic regression analysis of risk factors

Those non-collinear variable with P≤ 0.25 and reasonable frequency of categories of variable were entered into the final model. Additionally raw meat and raw milk which are biologically associated with toxoplasmosis were entered into the final model regardless of their P-value.

The Multivariable logistic regression analysis showed that only study area [P = 0.001], consumption of raw vegetables [P=0.043] and pregnancy status [P = 0.028] were independent predictors of toxoplasmosis [Table 12].

The following variables were collinear: precaution during cat feces cleaning verses contact with cats and cats at home; contact with cats verses cats at home; house floor type verses residential place. Thus, residential place, presence of cat at home and precaution during cleaning cats' feces were excluded from the final model. We didn't observe any significant interactions among the variables offered to the final model.The final model predict the data well. The P-value of Hosmer and Lemeshow goodness of fit test [P = 0.483] and chi-square = 7.51, df = 8] indicates that the data collected fitted the model and is significant.

Table 12: Multivariate logistic analyses of risk factors and seroprevalence of *T.gondii* infection in child bearing age women of Central Ethiopia, February 2012.

Risk factor	Coefficient	SE	P-value	aOR	95%CI of OR
Study areas	0.496	0.155	0.001*	0.593	0.192, 0.800
Age	0.250	0.193	0.195	4.5	-0.128, 0.628
Level of education	-0.100	0.156	0.521	2.1	-0.407, 0.206
Pregnancy status	0.628	0.286	0.018*	0.6	1.13, 3.59
Abortion	0.208	0.369	0.573	2.3	-0.515, 0.931
Raw vegetable consumption	-0.631	0.373	0.043*	2.21	-1.361, 0.099
Raw meat consumption	0.125	0.314	0.691	4.1	-0.490, 0.740
Raw milk consumption	-0.294	0.397	0.460	1.2	-1.072, 0.485
Handwashingafter Hs	0.524	0.303	0.083	1.7	-0.069, 1.118
Presence of cat at home	0.489	1.019	0.631	1.5	-1.507, 2.486
Precaution while clean CF	0.058	0.865	0.947	2.3	-1.638, 1.754
HIV status	-0.000	0.001	0.879	2.2	-0.002, 0.002
Constant	-1.047	1.388	0.451	4.5	--3.767, 1.673

5.2. Knowledge and Perception of health professionals towards Toxoplasmosis

5.2.1. Socio demographic characteristics of health professionals

A total of one hundred physicians, Nurses and gynecologist attending pregnant women in the selected health institution of the central Ethiopia were surveyed. Of these, 35 and 65 were males and females respectively. Male to female ratio is 0.53. The health professionals consisted mostly of women [65%]. The mean age of respondents was 27.2 years ranging from 21 to 47 years old and half of respondents were belongs to 25-40 years age group.

Among health professionals, 40% of them had diploma, 30% of them had bachelor degree, 20% of them had medical degree and 6% of them specialize in their profession. Most of the health professionals [60%] had 4-6 years of work experiences in their professions [Table 13].

Of them, 74 were Nurses, 20 general practitioners, and 6 gynecologists. They were asked about [i] general aspects about toxoplasmosis including clinical manifestations, diagnosis and, treatment, [ii] their practices and experiences on toxoplasmosis.

Table 13.Socio-demographic characteristics of health professionals in selected health institution of Central Ethiopia, February 2012.

Professions	Nurses [N=74]	Physician [N=20]	Gynacologist [N=6]	Total	P=value
Sex					
M	20[27]	13[65]	2[33.3]	35[35]	0.007*
F	54[73]	7[35]	4[66.7]	65[65]	
Age group[years]					
<25	20 [27]	2[10]	0[0]	22[22]	
25-40	54[73]	14[70]	4[66.7]	72[72]	0.846
>40	0[0]	4[20]	2[33.3]	6[6]	
Educational status					
Diploma	40[54]	0[0]	0[0]	40[40]	
BSc	34[46]	0[0]	0[0]	34[34]	0.000*
MD	0[0]	20[100]	0[0]	20[20]	
MSc	0[0]	0[0]	6[100]	6[6]	
Service years[Years]					
2-4 years	19[25.7]	4[20]	2[33.3]	25[25]	
4-6 years	34[46]	8[40]	3[50]	45[45]	0.177
>6 years	21[28.3]	8[40]	1[17.7]	30[30]	

Number in parentheses is percentage of respondents ***-** Shows that significance difference occur

5.2.2. General knowledge and perception of health professionals about Toxoplasmosis

From health professionals, 65 % [65] and 63% [63] of them had knowledge of health risk of cat and toxoplasmosis respectively. Consumption of raw or undercooked meat and vegetables were recognized as the common source of *T.gondii* infection by 71.2% health professionals, but consumption of raw milk [18.4%], contact with cat faces [14.3%], and drinking unboiled water[6.1%] were also mentioned as important modes of transmission.

Of health professionals, 42.5% respondents considered as avoid contact with cat faces is the most commonly used method for preventing the spread and transmission of toxoplasmosis. More over 35% respondents mentioned that transmission of toxoplasmosis could be prevented by keeping personnel hygiene, avoid undercooked food substances [meat, vegetables and milk] [15%] and avoid unboiled water for drinking purpose [7.5%].

In the current study, 56.7% and 47.3% of health professionals not knew the importance of testing toxoplasmosis during pregnancy and symptoms of toxoplasmosis respectively. The four commonly recognized symptoms of toxoplasmosis mentioned by health professionals were hydrocephalus [33.3%], mental/brain retardation [26.9%], microcephaly [25.4%] and hearing loss [14.3%].

Majority of health professionals [93%] do not screen pregnant women but 78% of them had the case or exposure of toxoplasmosis in HIV patient and pregnant women. All health professionals didn’t gave health education for the pregnant women regarding modes of transmission and prevention of toxoplasmosis.

The most commonly used method of diagnosis known by health professionals for toxoplasmosis were clinical examination [66.7%] but serology [17.5%],ultra sound [11.1%] and CT scan [4.7%] were also mentioned by respondents as method of diagnosis for toxoplasmosis. Seventy percent [11/63] of health professionals only requested laboratory tests for detecting toxoplasmosis. The greatest number of health professionals concentrated on clinical issues.

In studying the altitudes and practices of respondents,52.7% and 47.6 % of health professionals thought toxoplasmosis as important pathogen in HIV infected patients and pregnant women but Less than half of professionals, 44.4%, knew the medication of toxoplasmosis in pregnant and neonates but 22.3 of respondents they don't knew what they do if pregnant women and neonats became toxoplasmosis positive.

Comparing the number of answers according to type of profession, the professionals who are gynecologist and physician showed the total number of correct answers on the issues of clinical manifestation, prevention and diagnosis, higher than those who are nurses however nurses had a better experience [23%] of using laboratory test relative to other professionals.

In the comparison according to the professions, the gynecologist had the highest number of correct answers in the diagnostic and clinical issues. Regarding prevention, no significant differences were found between the two professional categories. Mostly nurses had better knowledgethan Physician but in medication physician had more awareness relative to nurses.

Table 14.Health professional's knowledge about general aspects of Toxoplasmosis in central Ethiopia, February 2012

Profession	Nurse [N=74]	Physician [N=20]	Gynecologist [N=6]	Total	P=value
Know disease human could get from cats					
No	35[47.3]	0[0]	0[0]	35[35]	0.000*
Yes	39[52.7]	20[100]	6[100]	65[65]	
know Toxoplasmosis					
No	35[47.3]	2[10]	0[0]	37[37]	0.009*
Yes	39[52.7]	18[90]	6[100]	63[63]	
Do you know that women could get toxoplasmosis from cats	44[59.4]	2[10]	0[0]	46[46]	
No	30[40.6]	18[90]	6[100]	54[54]	0.009*
Yes					
Methods of transmission of toxo from animals to human beings	12[30.7]	1[5]	0[0]	13[20]	
No	27[69.3]	17[95]	6[100]	50[80]	0.003*
Yes					
Methods of Transmission					
Contact with cat faces	2[7.4]	5[29.4]	1[16.7]	7[14.3]	
Raw meat consumption	8[29.6]	6[35.3]	1[16.7]	15[30.6]	0.078*
Raw milk consumption	7[26]	1[5.8]	1[16.7]	9[18.4]	0.006*
Raw vegetables consumption	9[33.3]	4[23.5]	2[33.2]	15[30.6]	
Unboiled water	1[3.7]	1[5.8]	1[16.7]	3[6.1]	
Know Prevention Method					
No	10[25.6]	12[66,7]	0[0]	22[35]	
Yes	29[74.4]	6[33.3]	6[100]	42[65]	0.003*
Method of Prevention					
Avoid cat contact					
Avoid consuming raw food	8[44.5]	8[50]	1[16.7]	17[42.5]	
Personal hygiene	1[5.5]	3[18.7]	2[33.3]	6[15]	0.000*
Avoid unboiled water for drinking	9[50]	4[25]	1[16.7]	14[35]	
	0[0]	1[6.3]	2[33.3]	3[7.5]	

Importance of testing toxo plasmosis during regnancy					
No	42[56.7]	0[0]	0[0]	42[42]	
Yes	32[43.3]	18[100]	6[100]	58[58]	0.000*
Know symptoms of toxo					
No	35[47.3]	2[10]	0[0]	40[40]	0.009*
Yes	39[52.7]	18[90]	6[100]	60[60]	
Symptoms of toxo					
Brain /mental retards	7[18]	8[44.4]	2[33.3]	17[26.9]	
Hearing loss	6[15.4]	2[11.1]	1[16.7]	9[14.3]	
Hydrocephalus	17[43.6]	3[16.6]	1[16.7]	21[33.3]	0.007*
Microcephaly	9[23]	5[27.7]	2[33.3]	16[25.4]	
Case of toxoplasmosis					
No	15[20.3]	5[25]	2[33.3]	22[22]	
Yes	59[79.7]	15[75]	4[66.7]	78[78]	0.711
Providing health education for pregnant for toxo					
No	74[74]	20[20]	6[6]	100	
Yes	0[0]	0[0]	0[0]	0[0]	
Screen pregnant women for toxoplasmosis					
No	73[90]	18[90]	2[33.3]	93[93]	
Yes	1[10]	2[10]	4[66.7]	7[7]	0.000*
Diagnosis of toxoplasmosis					
Clinical	24[61.5]	14[77.7]	4[66.7]	2[66.7]	
CT scan	0[0]	3[16.7]	0[0]	3[4.7]	
Serology	9[23]	1[15.6]	1[16.7]	11[17.5]	0.000*
Ultrasound	6[15.5]	0[0]	1[16.6]	7[11.1]	
Importance of Toxo in pregnant women					
Important	10[25.6]	14[77.7]	6[100]	30[47.6]	
Not Important	5[12.8]	3[16.7]	0[0]	8[12.6]	
Don't know	24[61.6]	1[15.6]	0[0]	25[39.8]	0.000*
Importance of Toxo in HIV infected patient					
Important	13[33.3]	14[777]	6[100]	33[52.4]	
Not Important	6[15.3]	4[32.3]	0[0]	10[15.9]	
Don't know	20[51.4]	0[0]	0[0]	20[31.7]	0.000*
Response for Toxo positive					
Medication	10[25.6]	12[66.6]	6[100]	28[44.4]	
Refer to specialist	15[38.4]	6[33.4]	0[0]	21[33.3]	
Don't know	14[36]	0[0]	0[0]	14[22.3]	0.094

Number in parentheses is percentage of respondents***-** Shows that significance difference occur

6. Discussion

6.1. Seroprevalence study

Overall, a very high seroprevalence of toxoplasmosis of 81.4% [95% CI=77.70, 85.13] was found in women of child-bearing age in Central Ethiopia. This high figure is in agreement with other seroprevalence figures from general or selected populations in different parts of the country that ranged from 60.0 - 97.7% [18-21]. However, it is much higher than the 20.2% found in pregnant women referred to the National Health and Nutrition Research Center [Addis Ababa] for pregnancy related laboratory examinations [24]. The high seroprevalence could be attributed to cat density, inadequate hygiene, feeding habits and suitable climatic factors for sporulation and survival of oocysts in the environment.

Looking into the previous prevalence reports and comparing them with the results of our study, toxoplasmosis in women is still on the rise in Ethiopia perhaps due to the lack of awareness about the disease, as indicated by all respondents in this study [unpublished observations]. In contrast, a decline in seroprevalence was noted in Greece and some other developed nations [3, 5, 28-31,51, 52] due to increased awareness and improved socioeconomic conditions. The prevalence of human toxoplasmosis across the world ranges from 4% in Korea to 92% in Brazil [5]. According to Kapperud et al. [53] the relative importance of the risk factors also varies between countries due to differences in cultural patterns and climatic factors affecting oocyst survival. Study area, study population, sample size, age, sensitivities of serological techniques employed, cat densities in the areas and access of cat to contaminate feed and water with oocysts and geographical variability may account for some of the differences in the reported seroprevalence rates [4,5].

The Toxoplasma IgG positive and lgM negative results [69.4%, 295/425] suggest past exposure to the parasite or old infection, while positive results for IgM [20.5%, 87/425] are indicators of acute or recent exposures. Though positive IgM results are characteristic markers of recent infections further confirmation to exclude reaction of natural IgM antibody with Toxoplasma antigen is needed [54]. IgM antibodies can persist for a long time with no risk of congenital infections. Besides, non-pregnant women negative for IgG and IgM antibodies [40/212, 18.9%]

are at risk of primary infection and should be monitored for seroconversion in case they become pregnant [54]. Among the pregnant women of the study [26, 12.2%] were IgG negative and IgM positive and [31,14.6%] were both IgG and IgM positive, which means 26.8% of the women had detectable IgM antibodies during pregnancy with potentially high risk of congenital toxoplasmosis warranting attention to design preventive measures.

Of the 17 potential risk factors assessed for association with *T. gondii* seropositivity, study area [P = 0.003], pregnancy status [P = 0.018] and consumption of raw vegetables [P=0.043] were found to be independent predictors of toxoplasmosis seropositivity.

The association of the seroprevalence with the study areas may be a reflection of the life style of the people that makes them more predisposed to the infection as well as the favorable climatic conditions for *T. gondii* oocysts to sporulate. The higher seroprevalence of toxoplasmosis in women of Debre-Zeit and Addis Ababa compared to Ambo could probably be attributed to the increasing trend of raw vegetables consumption [55] and high usage of water that might have been contaminated with *T. gondii* oocysts. On the other hand, the higher seroprevalence of toxoplasmosis in Metehara compared to Ambo could be attributed to the combined effect of the presence of cats at home [91.7%], rural background of sampled women [95%], inadequate sanitation and contact with cats [93.3%] rather than raw vegetables consumption [28.3%]. Furthermore, the free movement of people of Metehara leading to acquiring of the infection from other areas might additionally explain the situation.

The seroepidemiological studies conducted in sheep [45.3%] and goats [40.2%] of these same areas was consistent with seroprevalence results in women of Adea district. However, considering the arid and semi-arid nature of Metehara [unfavorable for oocyst survival] and low seroprevalence of toxoplasmosis in sheep [13.4%] and goat [15.4%] [56,57] the high seroprevalence in women is controversial. It is possible that women might have higher exposure than animals to cat-originated oocysts since people have a close contact to pet cats. Although consumption of raw sheep and goats' milk is a common tradition in Metehara pastoralists, only 21.7 % of interviewed women reported such a habit. We recommend further large scale

study in Metehara to clarify the high seroprevalence in order to draw reliable conclusions. Variation of *T. gondii* seroprevalence with geographical location has been noted [5, 7, 45].

In Ethiopia, antenatal screening of toxoplasmosis is not done unless health professionals have strong suspicion of pregnancy complication in which case patients are referred to the National Health and Nutrition Research Center and other private hospitals and laboratories in Addis Ababa for a better diagnosis. Unlike the reports of Gubre-Xiaber *et al.* [21], who suggested a low risk of *T. gondii* infection during pregnancy, our findings indicated that a considerable number of pregnant women had recent infections [26.8%, 57/213 IgM positives].

The high recent infection rate in pregnant women is alarming and emphasizes the need of developing antenatal care programs for toxoplasmosis in Ethiopia. In addition, the higher seroprevalence rate in pregnant women indicates that they are living in a highly contaminated environment. Pregnant women are more susceptible due to immunosuppressant condition of pregnancy where the innate immunity protecting against *T. gondii* is altered during the 30th and 34th weeks of gestation [58]. On the other hand, Biedermann et al. [59] mentioned that it is difficult to associate the high seroprevalence in pregnant women with immunosuppression as reactivation of latent toxoplasmosis is rare at least in immunocompetent mothers.

Although we did not perform CD4+ lymphocyte count of HIV positive pregnant women, there is a chance of reactivation of latent infection with a possibility of congenital transmission. Thus, a prophylactic treatment to prevent maternal reactivation and vertical transmission of toxoplasmosis may be useful [59].

Although HIV status was not an independent predictor by the final model, HIV positive women [88.4%] are more likely to acquire *T. gondii* [OR = 2.03, 95% CI: 1.07, 3.85] in the univariate analysis, as compared to HIV negative women [78.9%]. This deserves special attention as there is a high chance of reactivation of latent infection and development of toxoplasmic encephalitis [3, 7]. The high seroprevalence of toxoplasmosis in HIV positive women might partly be due to early child hood and teenage infection. In contrast, Biedermann *et al.* [59] and Weldemichael *et*

al. [23] reported similar seroprevalence rates between HIV infected individuals and normal controls.

A relative increase in the seroprevalence rate was observed with increasing age, as it pertains to the cumulative effect of exposure to the infective stages of the parasite. Once seroconvertion occurred, IgG antibodies persist for life. About 73.3% of the women seroconverted by the time they reach 15 - 20 years of age, most likely following acquisition of oocyst from the environment [as consumption of raw meat for this age group is uncommon]. Gubre-Xiaber *et al.* [21] reported that 75% of Ethiopian children were seroconverted before puberty. Several studies have indicated an increase in seroprevalence with age [3, 10, 11, 21, 34, 45, 63, 66].

Despite the deep rooted tradition of raw and undercooked meat consumption in Ethiopia and the high seroprevalence of toxoplasmosis in sheep and goats [18, 56, 57, 67-69] there was no association between seroprevalence and raw/undercooked meat consumption [46% of pregnant women and 41.6% of all studied women consume raw / undercooked meat. In contrast, earlier studies in Ethiopia [18-21] and elsewhere [5, 61] demonstrated significant association between seropositivity and behavior of raw meat consumption.

Toxoplasma gondii infection was 2.21 times greater in individuals who ate raw vegetables than those who didn't. The generally poor hygienic method of transport and selling of vegetables coupled with the poor quality water used to wash vegetables might have provided the opportunities for contamination by *T. gondii* oocysts. Consonant with our results, Njunda et al. [60] from Cameroon, Liu et al. [62] from China and Kapperud et al. [61] from Norway reported raw vegetable consumption as an important risk factor for contracting toxoplasmosis. Seroprevalence of anti-*T. gondii* antibodies was higher in women who used unboiled river and well water for drinking purpose [87.3%] than those who used unboiled tap water [75.5%] [P=0.002], indicating contamination of river and well waters by oocysts from felids' feces and inadequate water management as reported by Petersen et al. [2]. These findings are consistent with the already documented scientific knowledge [2, 38-39,60, 63]. Toxoplasmosis was considered as one of water borne diseases [10, 64-65].

The seroprevalence of toxoplasmosis was significantly associated with the presence of domestic cats in the household [84.9%] than in their absence [76.1%] [P < 0.05]. The high seroprevalence observed in households where cats are absent suggest a high environmental contamination. Felids are the only definitive hosts responsible for shedding oocysts that contaminate the environment and become infective for a long time in water or soil [5].The present finding is in accordance with Isabelle *et al* [33], Acha and Szyfres [64] and, Negash *et al*. [19] who reported strong association of seroprevalence and the presence of cats. However, Sroka et al. [63] and Guebre-xabier et al. [21] reported absence of association between seropositivity and presence of cats at home.

We are reporting for the first time from Ethiopia that there is a significant association between *T. gondii* infection with pregnancy, consumption of raw vegetables and use of untreated well and river water.

Almost all study participants had no awareness or information regarding health risk of cats, sign and symptoms and health disorders of toxoplasmosis, modes of transmission and importance of testing for toxoplasmosis during pregnancy. Pregnant women's knowledge about toxoplasmosis is poor. In developing countries the awareness of Child-bearing age women towards toxoplasmosis is higher and different from the current study. The awareness of child-bearing age women in Greece and some other developed nations [3, 5, 43,51, 52] is increased.

6.2. Knowledge and Perception of health professionals towards Toxoplasmosis

A questionnaire based survey was conducted among health professionals for the assessement of knowledge and perception towards toxoplasmosis on selected health facilities of central Ethiopia. This study demonstrated that majority of health professionals [63%] recognized human get disease from cat and knew toxoplasmosis respectively. This finding was in agreement with others studies [44,46].Since the knowledge and/or awareness of health professionals is not adequate, there is a need for the improvement among health professionals in both patient education and self-education.

As numerous studies have shown, eating undercooked meat during pregnancy is the most important risk factor for toxoplasmosis seroconversion [41, 44, 70]. Similarly, in the current study majority of health professionals recognize consumption of raw or undercooked meat and vegetables as the common source of *T.gondii* infection.

With regard to direct advice given to pregnant women, all health professionals didn't gave health education for the pregnant women regarding modes of transmission and prevention of toxoplasmosis however studies in USA [41] showed almost all health professionals [98%] advised them to avoid raw meat and vegetables.Since consumption of raw vegetables in the current study was the primary risk factor for toxoplasmosis transmission, all pregnant women should be counseled to thoroughly cook all vegetables during pregnancy.About prevention, although 42.5% of professionals recognize avoid contact with cat faces is the most commonly used method for preventing the spread and transmission of toxoplasmosis, which is similar to other studies [27, 28,71],

Regarding to the diagnosis, More than 83% of professionals never request lab test test for diagnosis of toxoplasmosis which is very high relative to studies in mexico [25%] [70].The fact that the overall median number of correct answers and diagnosis from professionals working in hospitals were higher than those of the health center may in part be explained by the fact that professionals working in hospitals have more training in high-risk prenatal care. However, a higher number of correct questions of prevention among professionals health center were expected, since the health center has as one of its main missions educational activities aimed at preventing health problems [29].

Likewise, the median number of correct answers among physicians higher than that of nurses is expected in the diagnosis and clinical issues, as these issues are the object of focus in medical schools than in schools of nursing. However, the basic knowledge of nurses in issues related to prevention is inconsistent with the role of nurses as health educators [70].The greatest number of correct answers among the professionals with less training time is consistent with the literature that indicates an inverse correlation between knowledge and years of professional practice, justifying the need for recertification exams in some countries [41, 44]. Continued education

seems especially useful when targeted to specific groups and disciplines [70] like our target population.

7. Limitation of the study

- Committing potential errors by respondents due to recall bias and low health related knowledge [all women have no awareness about health risk of cats to humans] for some of our questions [leading to false negative response]

- Failure to include species of food animals used for meat to correlate seropostivity with food producing animals.

- In this study only 100 data of health professionals are analyzed to asses their knowledge and perception but it is preferable to analyze all 422 data of health professionals for better finding.

- Failure to do IgG avidity test to exclude reaction of natural IgM antibodies and to know exactly the current status of the patient

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8. Conclusion and Recommendation

8.1. Conclusion

In the present study 81.4% anti-*T. gondii* IgG and 20.5% anti-*T. gondii* IgM seroprevalence rates, indicators of latent and recent *T. gondii* infections were detected. The study illustrated a reasonably high IgM positive pregnant women [43/213, 20.7%] indicating vulnerability to congenital transmission. It was also identified study area, raw vegetables consumption and pregnancy as important risk factors to acquire *T. gondii* infection in women of child-bearing age.

The high seroprevalence of toxoplasmosis in the current study suggest the need of preventive measures, mainly health education about identified risk factors, in order to reduce associated morbidities and mortalities. The results of the present study help to alert the public health delivery system to undertake large scale studies and uncover the economic and health impacts and formulate guidelines and policies leading to mitigation of the potentially devastating outcomes of this zoonosis.

Moreover,almost all child bearing age women had no awareness or information regarding toxoplasmosis.Only 63% of health professionals had knowledge about the disease.Therefore,the knowledge of health professionals especially nurses is not adequate as their main role is providing healtheducation for their pregnant women to maintain safe delivery.

Only half of the respondents were aware the treatment and more than 83% never request laboratory test for detecting toxoplasmosis.The health professionals surveyed showed an incomplete knowledge about diagnosis and treatment of toxoplasmosis. All health professionals didn’t give health education for the pregnant women regarding the disease Such findings proves toxoplasmosis is consider as neglected disease eventhough it had various complication during pregnancy and on newborn health.Therfeore urgent providing of medical education and self learing is needed.Because such findings are useful for optimal design of strategies in the medical education about toxoplasmosis.

8.2. Recommendation

In light of the findings and the above conclusion the following recommendations are forwarded.

- Health education should be given with special consideration to pregnant women and immunosuppresed individuals regarding minimizing contact with cats, avoidance of consumption of raw meat, vegetables and milk and unboiled river water.

- Owned cats should be kept in separate housing/kennel and not to allow eating of raw animal products.

- Proper hygienic practices should be exercised with the aim of reducing contamination of drinking waters and food by cat feces.

- Continuing education and refresh training should be given to health professionals to upgrade the knowledgeand perception on congenital toxoplasmosis.

- Team work between veterinarian and human health physician is should be encouraged to increase the public awareness about toxoplasmosis and its associated risk factors and transmission pathways, via health extension service in rural and urban communities.

- Assessment of health professionals KAP in large scale towards toxoplasmosis is also recommended.

- It is recommended that if screening test for prenatal follow considers toxoplasmosis.

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ANNEX I-QUESTIONNAIRES TO ASSESS TOXOPLASMOSIS RISK FACTORS AND AWARENESS IN CHILD BEARING AGE WOMEN IN CENTRAL ETHIOPIA

Part 1. Patient Identification and demographic Questions Date_____/_____/_____

101. Code No_____ 102.Card No. _____

103. Hospital/health center name _____104.Study areas/towns Name_____

105. Address:Woreda_____Kebele_____Tell No_____ House No_____

106. Age [in years] _____

107. Religion:

1. Orthodox 2.Protestant 3. Muslim

108. Residence place /Locality: 1.Urban 2. Rural /Countryside

109. Level of education

1. Tertiary /University 2. Secondary School 3. Primary school 4. Illiterate

Part 2.Socioeconomic variables of child bearing age women

201. Residential house made of: 1.Brick 2. Soil

202. Residential house floor: 1.Cemented 2. Soil

203. Employment status: 1.Employed 2.unemployed

204. Occupation Type

1. Government employee 2.Non-governmentalorganization

3. Farming 4.others 5.No work._____

205. Monthly Income level: _____ birr

Part 3.Host related risk factors of child bearing age women

301. Marital status: 1.Married 2.Unmarried

302. Are you pregnant? 1. Yes 2.No

303. If you are pregnant

1. First pregnancy 2.More than one pregancy

304. If you are pregnant what is the stage of pregnancy [age of fetus]

1. First trimester [< or equal to 3 months] 2.Second trimester [3 to 6 months]

3. Third trimester [greater than 6 months]

305. Expected date of delivery [EDD] _____

306. Have you had or experienced an accidental abortion before? 1. Yes 2. No

307. Have you ever seen any [mental??] or eye damage in any of your children? or in your family? 1. Yes 2.No

308. Would you please provide us with your HIV/AIDS status? 1. HIV positive 2. HIV negative

Part 4.Feeding habit and hygienic condition of child bearing age women

401. Do [did] you ever eat raw meat / raw offal's or food containing raw meat? 1. Yes 2. No

402. Do [did] you ever taste raw meat or a raw meat paste when cooking? 1. Yes 2. No

403. Do you wash hands carefully after handling raw meat? 1. Yes 2. No

404. Do you consume raw vegetables? 1. Yes 2.No

405. If your answer for question No. 404 is yes, how often do you consume vegetables?

1.Rarely 2.At least once /Wk

406. Do you wash raw vegetables before consumption? 1. Yes 2.No

407. Do you consume raw milk? 1. Yes 2.No

408. What is the source of your drinking water?

1. unboiled Tap water 2. Unboiled well and river

409. Do you have exposure with soil or your work exposes you to contact with soil?

1. Yes 2.No

410. If your answer to question No. 409 is yes tick one

1. Garden 2.Town house 3. Farming

411. Do you wash hands after gardening? 1. Yes 2.No

Part.5.Study participant's relation with cat

501. Do [did] you have [had] cats at home? 1.Yes 2.No

502. Do [did] you often touch or play with cats or kitten? 1. Yes 2.No

503. Did you have exposure to cats' faeces while cleaning or disposal? 1. Yes 2.No

504. Cat housing and feces disposal

a. Do you have separate house [kennel] for your Cat? 1. Yes 2.No

b. If yes, do you clean cat house? 1. Yes 2.No

c. If yes, how often? _____

d. Who cleans cat house? 1. Female member only 2. Male member only 3. Both sexes

e. Do you have precautions while cleaning? 1. Precautions 2. No precautions

f. Where do you dispose cat's feces?

1. Burry in the garden 2. Open garden 3. Toilet

Part 6.Toxoplasmosis knowledge and awareness

601. Do you know any disease women could get from cats? 1. Yes 2.No

602. If yes to question No.601, which ones? Mention them _____, _____,

603. Do you know that women could get toxoplasmosis from cats? 1. Yes 2.No

604. Do you know methods of transmission of toxoplasmosis from animals to human beings?

1. Yes 2.No

605. If yes to Question 603 and 604, indicate the methods of transmission of toxoplasmosis to humans

1. Consumption of raw or undercooked meat 2.Consumption of raw vegetable or fruits
3. Consumption of raw milk 4.Drinking unboiled water
5. Contact with cats 6.Contact with cats faeces
7. Unwashed hands after Gardening 8. Poor personal hygiene
9.From mother to fetus in the womb

606. Do you think it is important to be tested for toxoplasmosis during pregnancy?

1. Yes 2.No

607. Do you know the symptoms of toxoplasmosis in mother or fetus? 1. Yes 2. No

608.If yes to Question 607.What are the symptoms of toxoplasmosis in mother/fetus_____

Thank you very much for participating in our study.

Annex II: Blood sample collection format

Date____/_____/_____

Name of Study Area_____Name of Health Institution_____

Data code	Sample code	Age	Pregnancy status	abortion	Raw meat consumption	Raw vegetables consumption	Raw milk consumption	Source of water

Annex III.Questionnaire to assess knowledge and perception of health professionals/physicians, Nurses and Gynecologists/ in selected health institution of central Ethiopia

Date_____/_____/_____

Part 1: Health professional's identification and demographic questions

101. Code No _____102. Sex 1.M 2.F 103.Age [in years] _____

104. Service years/work experiences_____

105. Type of professions_____ 106.Where do you work? 1. Hospitals 2.Health center

107. Educational Status

1. Diploma 2. BSc 3. MD 4. MD + Specialization 5. MD + Specialization +PhD

Part 2: Knowledge and perception Assessment questions

201. Do you know any disease human could get from cats? 1. Yes 2.No

202. Do you know Toxoplasmosis? 1. Yes 2. No

203. Do you know that women could get toxoplasmosis from cats? 1. Yes 2.No

204. Do you know methods of transmission of toxoplasmosis from animals to human beings?

1.Yes 2. No

205. If yes to Question 203 and 204,indicate the methods of transmission of toxo to humans

1. Consumption of raw or undercooked meat 2.Consumption of raw vegetable or fruits
3. Consumption of raw milk 4.Drinking unboiled water 5.Contact with cats
6. Contact with cats faeces 7.Unwashed hands after Gardening 8.Poor personal hygiene
9. From mother to fetus in the womb

206. Methods of Transmission

1. Avoid cat contact 3. Avoid consuming raw food
2. Personal hygiene 4.Avoid unboiled water for drinking

207. Do you think it is important to be tested for toxoplasmosis during pregnancy?

1.Yes 2.No

208. Do you know the symptoms of toxoplasmosis in mother or fetus? 1. Yes 2.No

209.If yes to Question 208.What are the symptoms of toxoplasmosis in mother/fetus_____

210. In your opinion, how important is toxoplasmosis as a pathogen to HIV/AIDS patients and child bearing aged women in Ethiopia?

1. Important 2. Not important 3.Don‘t know

211.In your opinion, how important is toxoplasmosis as a disease in immunocompetent individuals in your working area?

1. Important 2. Not important 3.Don‘t know

212. What do you do if a women become toxo positive for first time during pregnancy/ become toxo positive [by ultrasound, serology, symptoms]

1. Medication 2.Refer to specialist 3.Don ‘t know

213. Do you screen pregnant women for toxoplasmosis? 1. Yes 2. No

214. Have you ever come across case of Toxoplasmosis? 1. Yes 2. No

215. If yes to Question 216,

A.In which type of people? 1. HIV positive 2.HIV negative

B.In which age group? 1. Newborn 2.Infants 3.Teenagers 4.dults 5.Older people

216. How do you diagnose toxoplasmosis?

1. Clinical symptoms 2.Serology 3.Ultrasound 4.CT scan 5.Other, please specify _____

217.Do you give educational program for toxoplasmosis to pregnant women during prenatal visits? 1. Yes 2.No

218. From your experience how common is abortion due to toxoplasmosis?

1. Common 2. Not common 3. Don’t know

219. From your experience how common are congenital signs or lesions [hydrocephalus, microcephaly, etc.] due to toxoplasmosis?

1. Common 2. Not common 3. Don’t know

220. Please provide us any further comments, if you have any, in relation to toxoplasmosis in your working area.

_____

_____

Thank you so much for taking your valuable time to respond to our research questions!

Annex IV. Information Sheet read to the respondents

My name is Anteneh Hailu, a student of Addis Ababa University, School of Allied Science, Departement of Medical laboratory Science. The aim of the study is to undertake sero-epidemiological investigation, and assessment of risk factors contributing to the transmission and occurrence of toxoplasmosis in child bearing age women in selected health institution of central Ethiopia.

The laboratory analysis will be conducted in Addis Ababa University, faculty of Veterinary Medicine, Microbiology and Immunology laboratory, Debre-zite, Ethiopia.The study will be conducted through analysis of blood samples by ELISA and Mice model. I would like to interview few question about risk factors for toxoplasmosis and situation in pregnant women..Your cooperation and willingness for interview will be very helpful in identifying the risk factors for toxoplasmosis. Your name will not be written in the form and I assure you all the information you give will be kept strictly confidential. Your participations is voluntary and you are not obliged to answer any question that you do not want to answer. If you are not comfortable with interview, please feel free to stop in any time you like. Your participation or not do not have any influence for your service that you want to use. In addition in your participation in the study do not have any invasive procedure, only give 5ml venous blood as recommended by the health personnel and each questionnaire only take 10-15 minutes. At the end of the study the results of the patients or child bearing age women who develop *T. gondii* infection will be announced by their health institute and will be treated by announce to concerned body. For the successes of our study, we will be asking to give correct answer for respective questions.

Thank you for your assistance. Continue answering those questions

Annex-V.Consent form prepared for study participants

I_____here by giving my consent for giving blood samples as recommended by health personnel for seroepidemology and risk factor assessment. I understand there is no serious invasive procedure at the beginning as well as the end of the study. I understand this study will be used not only for me but also for other child bearing aged women and others. I believe that at the end of study the result also explain for concerned body only for the purpose of the study.

Signature_____Date_____

Thank you in helping with this important study.

N:B.If you want to request additional information about the study, you can contact us through 0910-140762 or 0911107099

Annex VIa-Amharic version of Questionnaires

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ክፍልአንድ፡-የተሳታፊዎች አጠቃላይ መረጃ መለያ

101.መለያ ቁጥር ----------102.ካርድ ቁጥር----------103.የጠና ድርጅቱ ስም----------
-104፡የጥናቱ ከተማ ስም----------

105.አድራሻ----------ወረዳ----------ቀበሌ----------ስልክ----------የቤት ቁጥር --------

106.እድሜ.----------

107.ሀይማኖት 1.ኦርቶዶክስ 2.ሙስሊም 3.ክርስቲያን

108.መኖሪያ ቦታ 1. ከተማ 2.ገጠር

109.የትምህርት ደረጃ 1.ኮሌጅ 2. 2ኛ ደረጃ 3.የመጀመሪያ ደረጃ 4.ያልተማረ

ክፍል ሁለት፡-የተሳታፊዎች የአኗኗር ሁኔታመለያ

201.የመኖሪያ ቤት የተሰራበት ግድግዳ 1.ብሎኬት 2.አፈር

202.የመኖሪያ ቤት ወለል የተሰራበት 1.ሲሚንቶ 2.አፈር

203.የቅጥር ሁኔታ 1.የተቀጠረ 2.ያልተቀጠረ

204.የስራ አይነት

1.የመንግስት 2.መንግስታዊ ያልሆነ ድርጅት 3.ንግድ 4.ሌላ ካለ

205.ወርሀዊ ገቢ---------- [ብር]

ክፍል ሶስት፡- የተሳታፊዎች የጋብቻና እርግዝና ሁኔታ አጠቃላይ መረጃ መለያ

301.የጋብቻ ሁኔታ 1.ያገባች 2.ያላገባች

302.የእርግዝና ሁኔታ 1.ያረገዘች 2.ያላረገዘች

303.እርጉዝ ከሆንሽ የእርግዝናው ጊዜ ቢገለጥ

1.ለመጀመሪያ ጊዜ [1-3 ወር] 2. ሁለተኛ ደረጃ[3-6 ወር] 3.ለሶስተኛ ደረጃ[6-9ወር]

304.እርጉዝ ከሆንሽ ስንተኛሽ ነው? 1.ለመጀመሪያ ጊዜ 2 ከዚያ በላይ

305.የሚወለድበት ጊዜ ቢገለጥ [በጠና ባለሙያ].....

306.**ከዚህ በፊት ድንገተኛ የሆነ ውርጃ አጋጥሞሽ ያውቃል? 1.ያውቃል 2.አያውቅም**

307.**በቤተሰባችሁ ውስጥ ወይንም በልጆች ላይ የአይምሮ ወይንም የአይን ችግር ያለበት አለ?**

1.አለ 2.የለም

308.**የኤች አይ ቪ ኤድስ ውጠትሽ ምን ይመስላል? 1.ኤች አይ ቪ ፖዝቲቭ 2.ኤች አይ ቪ ነጌቲቭ**

ክፍል አራት፡-የተሳታፊዎች የአመጋገብ እና የጠና አጠባበቅ አጠቃላይ መረጃ

401.ጥሬ ወይም በደንብ ያልበሰለ ስጋ ትመገቢያለሽ? 1.አውቃለሁ 2.አላውቅም

402.ጥሬ ወይም በደንብ ያልበሰለ ስጋ ስትሰሪ ቀምሰሽ ታውቂያለሽ?

1.አውቃለሁ 2.አላውቅም

403.ጥሬ ስጋ ከያዝሽ በኋላ እጅሽን በደንብ ትታጠቢአለሽ?

1.እታጠባለሁ 2.አልታጠብም

404.ጥሬ አትክልት ትመገቢአለሽ? 1.አዎ 2.አልመገብም

405.ከተመገብሽ ምን ያህል ጊዜ? 1.አልፎ አልፎ 2.በየሳምንቱ

406.ጥሬ አትክልት ከመመገብሽ በፊት ታጥቢአለሽ? 1.አጥባለሁ 2.አላጥብም

407.ጥሬ ወተት ትጠጫለሽ? 1.አዎ 2.አልጠጣም

408.ምን አይነት ውሀ ለመጠጥ ትጠቀሚአለሽ? 1.የቧንቧ 2.የጉድጓድ ና የወንዝ

409.ከአፈር ጋር ንክኪ ያለው ስራ አለሽ? 1.አዎ 2.የለኝም

410.ግንኙነት ካለሽ በምን አይነት ስራ 1.አትክልት 2.የከተማ ግብርና 3.ግብርና

411.ከአፈር ንክኪ በኋላ እጅሽን ትታጠቢአለሽ? 1.አዎ 2.አልታጠብም

ክፍል አምስት፡ ተሳታፊዎች ከድመት ጋር ያላቸው ግንኙነት በተመለከተ

501.የቤት ድመት አለሽ? 1.አዎ 2. የለኝም

502.ከድመት ጋር የመጫዎት ልምዱ አለሽ? 1.አዎ 2. የለኝም

503.ከድመት አይነምድር ጋር ንክኪ አለሽ? 1፡አለኝ 2፡የለኝም

504.የድመት ቤትንና አይነምድርን ማፀዳዳትን በተመለከተ

ሀ፡ለድመት ብቻ የተለዩ [የተነጠለ] ቤት አለሽ? 1.አዎ 2.የለኝም

ለ፡ካለሽ ቤቱን ታፀጂዋለሽ 1.አዎ 2. አላፀዳም

ሐ፡ካፀዳሽ ለምን ያህል ጊዜ?.....

መ፡ማነው ቤቱን የሚያፀዳው? 1.ሴት ብቻ 2.ወንድ ብቻ 3.ሁለቱም

ሠ፡ፅዳቱን በምታካሂጅበት ጊዜ ጥንቃቄ ታደርጊአለሽ? 1.አዎ 2.አላደርግም

ረ፡የት ነው አይነምድሩን የምትጥይው? 1.ቆፍሬ እቀብራለሁ 2.አትክልት አካባቢ

3.ሽንት ቤት 4.ሌላ ካለ…….

ክፍል ስድስት፡-ተሳታፊዎችስለቶክሶፕላስሞሲስ ያላቸውን እውቀትና አመለካከት በተመለከተ

601.ሴቶች ከድመት ሊይዛቸው የሚችል በሽታ ታውቂአለሽ? 1.አውቃለሁ 2.አላውቅም

602.መልስሽ አዎን ከሆነ እነማን ናቸው?.....

603.ሴቶች ከድመት ቶክሶፕላስሞሲስ እንደሚይዛቸው ታውቂአለሽ?

1.አውቃለሁ 2.አላውቅም

604.ቶክሶፕላስሞሲስ ከእንስሳት ወደ ሰው የሚተላለበትን መንገድ ታውቂአለሽ?

1.አውቃለሁ 2.አላውቅም

605.በየትኛው መንገድ ሊተላለፍ ይችላል?

1.ጥሬ ስጋ በመመገብ 2.ጥሬ አትክልት በመመገብ

3.ጥሬ ወተት በመጠጣት 4.ያልተፈላ ውሀ በመጠጣት

5.ከድመት ጋር ንክኪ በማድረግ 6.ከድመት አይነ ምድር ጋር ንክኪ በማድረግ

7.ከኩትኳቶ በኋላ እጅን አለመታጠብ 8.የግል ንፅህና ባለመጠበቅ

9.ከእናት ወደ ልጅ በማህፀን ውስጥ

606.በእርግዝና ወቅት ሴቶች ቶክሶፕላስሞሲስ መመርመር አለባቸው ብለሽ ታስቢአለሽ?

1.አውቃለሁ 2.አላውቅም

607.የበሽታውን ምልክቶች በእናቶች ወይም በህፃናት ላይ ታውቂአለሽ?

1.አውቃለሁ 2.አላውቅም

608.ከምታውቂአቸው ምልክቶች በከፊል ብትነግሪኝ?.....

በዚህ ጥናት በመሳተፍ ስለተባበርሽኝ በጣም አመሰግናለሁ፡፡

Annex VIb-Amharic version of Questionnaires

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ክፍል አንድ፡- የጠና ባለሙያዎች አጠቃላይ መረጃ መለያ

101.መለያ ቁጥር……..102.ዕድ 1.ሴ 2.ወ

103.እድሜ……104.የስራ ዘመን……..

105.የሙያ አይነት…….

106.የት ነው የምትሰራ/ረው? 1.ሆስፒታል 2.ጠና ጣቢያ

107.የትም/ት ደረጃ 1.ዲፕሎማ 2.ድግሪ 3.ህክምና ድግሪ 4.ማስተርስ 5.ፒኤችዲ

ክፍል ሁለት፡- የጠና ባለሙያዎች ስለ ቶክሶፕላስሞሲስ ያላቸውን አጠቃላይ እውቀት እና አመለካከት መረጃ

201.ሴቶች ከድመት ሊይዛቸው የሚችል በሽታ ታውቂአለሽ/ህ?

1.አውቃለሁ 2.አላውቅም

202.መልስሽ/ህ አዎን ከሆነ እነማን ናቸው?.....

203.ቶክሶፕላስሞሲስ የሚባል በሽታ ታውቃለህ/ሽ? 1.አውቃለሁ 2.አላውቅም

204.ሴቶች ከድመት ቶክሶፕላስሞሲስ እንደሚይዛቸው ታውቂአለሽ/ህ?

1.አውቃለሁ 2.አላውቅም

205.ቶክሶፕላስሞሲስ ከእንስሳት ወደ ሰው የሚተላለበትን መንገድ ታውቂአለሽ/ህ?

1.አውቃለሁ 2.አላውቅም

206. በየትኛው መንገድ ሊተላለፍ ይችላል?

1.ጥሬ ስጋ በመመገብ 2.ጥሬ አትክልት በመመገብ

3.ጥሬ ወተት በመጠጣት 4.ያልተፈላ ውህ በመጠጣት

5.ከድመት ጋር ንክኪ በማድረግ 6.ከድመት አይነ ምድር ጋር ንክኪ በማድረግ

7.ከኩትካቶ በኋላ እጅን አለመታጠብ 8.የግል ንፅህና ባለመጠበቅ

9.ከእናት ወደ ልጅ በማህፀን ውስጥ

207.በእርግዝና ወቅት ሴቶች ቶክሶፕላስሞሲስ መመርመር አለባቸው ብለሽ/ህ

ታስቢአለሽ/ህ? 1.አውቃለሁ 2.አላውቅም

208.የበሽታውን ምልክቶች በእናቶች ወይም በህፃናት ላይ ታውቂአለሽ/ህ?

1.አውቃለሁ 2.አላውቅም

209.ከምታውቂአቸው ምልክቶች በከፊል ብትነግሪኝ/ረኝ?.....

210.በአንተ አስተሳሰብ ምን ያህል በሽታው ለኤች አይ ቪ /ኤድስ በሽተናው ጠቃሚ ነው ብለህ ታስባለህ/ሽ?

1. ጠቃሚ 2. ጠቃሚ ያልሆነ 3..አላውቅም

211.በአንተ አስተሳሰብ ምን ያህል በሽታ ለሴቶች [ከ15-49 አመት] ምን ያህል ጠቃሚ ነው ብለህ ታስባለህ/ሽ?

1. ጠቃሚ 2. ጠቃሚ ያልሆነ 3..አላውቅም

212.አንድ ያረገዘች ሴት በቶክሶፕላስሞሲስ በሽታ የተያዘች ብትሆን ምን ታደርጋለህ/ሽ?……

213.አንድ ህፃን በቶክሶፕላስሞሲስ በሽታ የተያዘ/ች ብትሆን ምን ታደርጋለህ/ሽ?

214.ሴቶችን ለቶክሶፕላስሞሲስ መርምረህ ታውቃለህ/ሽ? 1፡አውቃለሁ 2፡አላውቅም

215.የቶክሶፕላስሞሲስ በሽታ ኢጋጥሞህ ያውቃል? 1፡አውቃለሁ 2፡አላውቅም

216.ካወቅህ ሀ.ምን አይነት ሰው ላይ ነው?

1.በኤችአይቪየተያዘ/ች 2.በኤችአይቪ ያልተያዘ/ች

ለ.በየትኛው የእድሜ ክልል

1.አመት በበታች 2.1-5 አመት 3.5-15አመት 4.ከ15አመት በላይ

217.ቶክሶፕላስሞሲስን የምትመረምረው እንዴት ነው?.....

1.ክሊኒካል 2.ሴሮሎጂ 3.አልትራሳውንድ 4.ሲቲስካን 5.ሌላ ካለ

218.ኮጅኔታል ቶክሶፕላስሞሲስን ኢጋጥሞህ ካወቀ የትኛውን ምልክት በህፃኑ ላይ አይተሀል?

1. በፈሳሽ የተሞላ ትልቅ ጭንቅላት 2.ከተለመደው ውጭ የጭንቅላት መጠን ማነስ[ማይክሮሴፋሊ]

3. ውርጃ 4. የአይን ችግር

5. የመስማት ችግር 6. የአይምሮ ዝግመት

219.ከልምድ የተነሳ የትኛውን የቶክሶፕላስሞሲስ ምልክት በኤች አይ ቪ ነጌቲቭ ታካሚዎች ላይ ተመልክተሀል/ሻል

ነ.ሊምፋአዲኖፓዚ 2.ፊቨር[ከፍተኛ የሰውነት ሙቀት] 3.ቺል[ከፍተኛ የሰውነት መንቀጥቀጥ] 4.ኢንሰፋሊተስ

5.ፓራሊስስ 6. የአይን ችግር 7.ሌላ ካለ----------

220.ከምትከታተላቸው እርጉዝ ሴቶች ቶክሶፕላስሞሲስን በተመለከተ የጠና ትም/ት ሰጥተህ ታውቃለህ?

1፡አውቃለሁ 2፡አላውቅም

221.ከልምድህ የተነሳ ምን ያህል ድንገተኛ ውርጃ በቶክሶፕላስሞሲስ አማካኝነት ይከሰታል?

1. ሁሌ ይከሰታል 2. አይከሰትም 3. አላውቅም

222.ከልምድ የተነሳ ምን ያህል ኮጅኔታል ቶክሶፕላስሞሲስ ይከሰታል?

1. ሁሌ ይከሰታል 2. አይከሰትም 3. አላውቅም

223.ስለ ቶክሶፕላስሞሲስ ያለህን/ሽ አስተያየት ብትገልፅ/ጭ?.....

በዚህ ጥናት በመሳተፍ ስለተባበራችሁን በጣም አመሰግናለሁ፡፡

በጥናቱ ለሚሳተፉ ተሳታፊዎች የሚሰጥ መረጃ

ስሜ አንተነህ ሀይሉ እባላለሁ፡፡አዲስ አበባ ዩኒቨርስቲ በአላይድ ሳይንስ ት/ቤት በህክምና ላብራቶሪ ትም/ት ክፍል የክሊኒካል ላብራቶሪ ሳይንስ የድህረ ምረቃ ተማሪ ነኝ፡፡የጥናቱ አላማም የቶክሶፕላስሞሲስ በሽታ በሴቶች ላይ ያለውን የስርጭት መጠን እና መንስኤዎች እንዲሁም የጠና ባለሙያዎች ያላቸውን እውቀት እና አመለካከት በመካከለኛው ኢትዮጵያ በተመረጡ የጠና ተቋማት ለማጥናት ነው፡፡የላብራቶሪ ምርመራው የሚካሄው ደብረዘይት በሚገኘው አዲስ አበባ ዩኒቨርስቲ እንሰሳት ህክምና ት/ቤት ማይክሮባዮሎጂ ላብራቶሪ እና ሰበታ በሚገኘው ላብራቶሪ ሲሆን ጥናቱ የሚካሄደው እድሜአቸው ከ15-49 አመት የሚገኙ ሴቶች በሚሰጡት ከክንድ በሚቀዳ ደም ላይ ነው፡፡እርስዎ በሚሰጡት መረጃ ደግሞ በቀጣይ የቶክሶፕላስሞሲስን በሽታ ለመከላከል እና አስፈላጊውን የመከላከያ ዘዴ ለመንደፍ የሚደረገውን ጥረት ለማገዝ ይረዳል ፡፡እርስዎ የሚሰጡት መልስም ለማንም ይፋ አይሆንም ሚስጥርም ሆኖ ይያዛል፡፡የእርስዎ ስም በቃለ መጠይቁ ላይ አይፃፍም ፡፡የእርሶም ተሳትፎ በፈቃደኝነት ላይ የተመሰረተ ስለሆነ ቃለ መጠይቁን ለማቋረጥ ቢፈልጉ በጠና ድርጅቱ ከሚያገኙት ማንኛውም አገልግሎት ጋር ግንኙነት አይኖረውም፡፡በጠጨማሪም እርሶም በጥናቱ በሚሳተፉበት ወቅት ምንም አይነት እርሶን የሚጎዳ ሁኔታ አይኖርም፡፡የሚሰጡትን እንደጠና ሙያተኛው ትእዛዝ ከክንድ የሚወሰድ 5 ኤም ኤል ደም ሲሆን ለመጠይቁ የሚወስደው ከ10 እስከ15 ደቂቃ ብቻ ነው፡፡በጥናቱ መጨረሻም የጥናቱ ውጠት ለእያንዳንዱ ተሳታፊ በጠና ድርጅቱ በኩል የምርመራ ውጠት ይፋ ይደረግለታል፡፡እንዲሁም ከተሳታፊዎች መካከል በሽታው ላለባቸው ሚመለከተው አካል በማሳወቅ ህክምና እንዲያገኙ ይደረጋል፡፡ለጥናቱ ስኬታማነት ትክክለኛ መረጃ ይሰጠን ዘንድ በአክብሮት እንጠይቃለን፡፡

ስለተባበራችሁን አመሰግናለሁ፡፡ቃለመጠይቁን ይቀጥሉ፡፡

ጥናቱ የሚያካሂደው ባለሙያ ስልክ ቁጥር 910140762 ወይንም ለጥናቱ አማካሪ ስልክ ቁጥር 0911107099

ለጥናቱ ተሳታፊዎች የተዘጋጀ የፍቃደኝነት መግለጫ ቅፅ[ኮንሰት]

እኔ----------በዚህ ጥናት ውስጥ ለመሳተፍ በቂ ገለፃ ስለተደረገልኝ ከክንዴ ላይ ደም በጠና ባለሙያው ትዕዛዝ መሰረት ለመስጠትና ቃለመጠይቁን የሚያካሂደው ባለሙያ የሚጠይቀኝን ቃለ መጠይቅ ለመመለስ ፍቃደኝነቴን እገልፃለሁ፡፡በጥናቱ ወቅትም ከመጀመሪያ እስከ መጨረሻ ምንም አይነት እኔን የሚጎዳ ሁኔታ እንደሌለ ተረድቻለሁ፡፡ጥናቱም ለኔ ብቻ ሳይሆን ለሌሎችም እንደሚጠቅም ተረድቻለሁ፡፡ጥናቱም በመጨረሻም ጊዜ ለጥናቱ አላማና ለሚመለከታቸው አካላት ብቻ ይፋ እንደሚሆን ተረድቻለሁ፡፡

ፊርማ---------- ቀን-----/------/-------

በዚህ ጠቃሚ ጥናት ስለተባበራችሁኝ አመሰግናለሁ፡፡

Annex:VIII.Laboratory Investigation

1. Venous Blood Collection Procedures

- Give the patient confidence by explain to her the reason for venous blood collection
- Explain to the patient that
  - ✓ The tourniquet may feel tight.
  - ✓ The patient may feel a pinch or nothing at all when the needle is inserted into the vein.
  - ✓ There might be a small bruise at the site.
  - ✓ Keeping pressure on the site reduces the chance of bruising.
  - ✓ Taking anticoagulants (aspirin, Coumadin) may require keeping pressure on the site for more than 10 minutes to stop the bleeding.
  - ✓ The vein may become swollen after the test (phlebitis).
  - ✓ The patient should call their healthcare provider and apply a warm compress to reduce the swelling.
- Wrap a tourniquet around the patient's upper arm to stop blood flow and make veins easier to identify.
- Clean the puncture site with alcohol to remove debris and to increase blood circulation at site of venous puncture then Insert the needle into the vein with the bevel up then attach the appropriate test tube to the needle.
- Collect 5ml of blood and then remove the tourniquet to restore blood flow and finally Place a gauze pad over the site while withdrawing the needle.
- Apply firm pressure to the site until bleeding has stopped.

Serum Preparation

- Once 5ml venous blood is collected then centrifuge at 1000rpm for 10-15 minutes
- Separate serum from the sediment and dispense into labeled 2ml eppendrof tube
- Place the serum at -200c until serologically tested

2. Indirect ELISA IgG Test

General Information

This Indirect ELISA IgG kit is used to detect Immunoglobulin G class antibodies to T.gondii in human serum.

Principle- Classic EIA

The HUMAN TOXO IgG ELISA is based on the classical ELISA technique. The micro titer strip wells as a soild are coated with Toxoplasma antigens (Toxo-Ag) prepared from sonicated whole *Toxoplasma gondii* parasites (Tachyzoites).In the first incubation step corresponding specific antribodies (TOXO-IgG-Ab) present in patient specimens or controls bind to the antigens at the soild phase. At the end of incubation unbound components are washed out. For the second incubation step anti-IgG conjugate (anti-human IgG antibodies, peroxidase conjugated) is added which binds specifically to IgG class antibodies resulting in the formation of typical immune complexes.

After a second washing step to remove excess conjugate, TMB/substrate is added. A blue color develops changing to yellow after stopping the reaction. The intensity of the colors is directly proportional to the Toxoplasma IgG antibody [Toxo-IgG-Ab] concentration in the specimen.

The absorbance of controls and specimen is determined by using ELISA micro plate readers or automated ELISA systems [like HUMANs Huma-reader or SLISYs line].Results for the patient samples are obtained by comparison with the cut-off value. This test has been calibrated against in house standards.

Kit components [reagents and contents]

MIC-micro titer strips [breakable 8-well strips coated with sonicated Toxoplasma gondii Antigen] **NC**-Negative Control,**CC**-Cut Off Control,**PCL**-Postive Control Low,**PCM**-Postive Contro Medium,**PCH**- Positive Control High **DIL-G**-sample diluents, phosphate buffer,Nacl,Albumin ,**CON**-Anti-IgG conjugate (Anti-human IgG peroxidase-conjugate), **WS-Wash** Solution, **SUB-Substrate Reagent** (3, 3, 5, 5-tetramethylbenzidin-TMB), Hydrogen peroxidase, **STOP**-Stop Solution (Sulphuric acid).

Safety Notes

- Do not swallow the reagents and avoid contact with eyes, skin and mucus membranes.
- All patient specimen and controls should be handled as potentially infectious.
- Wear protective clothing and disposable gloves according to good laboratory practices.
- All materials contaminated with patient specimen and controls should be inactivated by validated procedures (autoclaving or chemical treatment) in accordance with applicable regulations.
- Assay reagents irritate eyes, skin and mucous membranes.
- Upon contact rinse thoroughly with copious amounts of water and consult doctors.
- C,PC and CC contains sodium azide which may react with metals of laboratory plumping forming explosive azides.
- Flush the conduit with copious amounts of water as preventive measure, in case sodium azide containing solution is disposed in the sink.

Stability

- The reagents are stable up to the expiry dates stated on the individual labels when stored at 2-8 oc.
- After opening reagents have to be stored at 2-8oc and used within 60 days.

Reagents Preparation

- Bring all reagents to room temperature (17…25oc) before use.
- Reagents not in use should always be stored at 2...8 oc.

Preparations of working wash solution (WASH)

- Dilute 1 part wash solution with 20 parts of fresh deionized water I a suitable container. E.g.50ml of wash solution with 1000ml of deionized water=1050ml, mix thoroughly for 15 seconds
- Stability: up to 60 days at 15…25oc

Specimen Preparation

- Once serum is separated from venous blood by using centrifugation, it was stored at -20oc until tested.
- The dilute patient's sera 1part with 100 parts of diluents (DIL-G).e.g.10µl serum mix with 1ml DIL-G mix thoroughly (15 sec).
- Diluted samples were used on the same day and PC, NC, and CC are ready for use and mix for 5 seconds.

Test Procedure

Step 1

- Label the plate as Blank[A],and sample wells
- Add 100 µl of NC[Negative Control] in duplicate to B1and C1 wells
- Add 100 µl of Cut Off Control in duplicate to D1-C2 wells
- Add 100 µl of PCL in duplicate to D1-C2 wells
- Add 100 µl of PCM in duplicate to D1-C2 wells
- Add 100 µl of PCH in duplicate to D1-C2 wells
- Place 100 µl of diluted serum samples to labeled sample wells

- cover the plate with adhesive strips and Incubate 30 min at 17…25oc
- Wash all plate 4 times by adding 350 µl to each wells.

Step 2

- Add 100 µl conjugate solution to all plates except blank well
- Cover the plate with Adhesive strips and Incubate the plates for 30 minutes at 17…25oc
- Wash the plates 5 times by adding by adding 350 µl to each well

Step 3

- Add 100 µl substrate to all wells
- Incubate the plates for 15 minutes at 17…25oc
- Stop the reactions by adding 100 µl stop solution to each wells and mix carefully
- Measure the absorbance at 450nm as soon as possible or within 10 minutes

Calculation of Control values and cut-off

Consider the OD of the blank (A1) and calculate mean absorbance values of NC (MNC),of CC (MCC) and of PCL.PCM,PCH of (MPCL,MPCM,MPCH) according to

$$MCC = \frac{A450\ (D1) + A450(E1)}{2}$$ where MCC refers Mean of Cut Off Control

The test run may be considered valid provided that the following criteria are met

Substrate blank in well A1<0.150

MNC≤MCC ,MCC>0.200, MPCM ≥0.750, MPCM/MNC≥5

Interpretation of results

A450(patient) ≥ MCC+15% anti-Toxo IgG-Ab-Positive

A450(patient) < MCC-15% anti-Toxo IgG-Ab-Negative

Reference:**www.human.de/data/gb/vr/el-toxog.pdf**

3.Indirect ELISA IgM Test

General Information

This Indirect ELISA IgM kit is used to detect anti-*Toxoplasma gondii* antibodies /IgM/in human.

Principle- µ-capture assay, Direct IgM detection

The HUMAN TOXO IgM µ-capture ELISA for direct IgM antibody detection uses anti-human IgM antibodies [mouse] coated on micro titer wells. All IgM class antibodies if present in the patient's specimen or the controls bind to the immobilized antibodies. After the incubation unbound specimen components are removed by washing. For the second incubation step Toxoplasma antigen HRP conjugate is added, which binds specifically to the anti-Toxoplasma IgM antibodies, captured by the immobilized anti-human IgM antibodies. After a washing step to remove excess conjugate, TMB /Substrate is added. A blue color develops changing to yellow after stopping the reaction. The intensity of the colors is directly proportional to the Toxoplasma IgM antibody [Toxo-IgM-Ab] concentration in the specimen.

The absorbance of controls and specimen is determined by using ELISA micro plate readers or automated ELISA systems [like HUMANs Huma-reader or SLISYs line].Results for the patient samples are obtained by comparison with the cut-off value. This test has been calibrated against in house standards.

Kit components [reagents and contents]

MIC-micro titer strips [breakable 8-well strips coated with specific anti-human IgM(mouse)] **NC**-negative control,**CC**-Cut Off Control,**PC**-Postive Control,**DIL**-sample diluents, phosphate buffer ,**CON**-Enzyme conjugate (Toxoplasma antigen peroxidase-conjugate),**C-DIL**-Conjugate Diluent,phosphate buffer,

WS-wash solution, **SUB-Substrate Reagent** (3, 3, 5, 5-tetramethylbenzidin-TMB), Hydrogen peroxidase, **STOP**-Stop Solution (Sulphuric acid).

Safety Notes

- Do not swallow the reagents.
- Avoid contact with eyes, skin and mucus membranes.
- All patient specimen and controls should be handled as potentially infectious.
- Wear protective clothing and disposable gloves according to good laboratory practices.
- All materials contaminated with patient specimen and controls should be inactivated by validated procedures (autoclaving or chemical treatment) in accordance with applicable regulations.
- Assay reagents irritate eyes, skin and mucous membranes.
- Upon contact rinse thoroughly with copious amounts of water and consult doctors.
- NC,PC and CC contains sodium azide which may react with metals of laboratory plumping forming explosive azides.
- Flush the conduit with copious amounts of water as preventive measure, in case sodium azide containing solution is disposed in the sink.

Stability

- The reagents are stable up to the expiry dates stated on the individual labels when stored at 2-8 oc.
- After opening reagents have to be stored at 2-8oc and used within 60 days.

Reagents preparation

- Bring all reagents to room temperature (17…25oc) before use.
- Reagents not in use should always be stored at 2...8 oc.

Preparations of Working wash conjugate solution (WCON)

- Dilute conjugate 1 part mix with 50 part of conjugate diluents
- Prepare fresh for each run 1s min before use.

Preparations of working wash solution (WASH)

- Dilute 1 part wash solution with 24 parts of fresh deionized water I a suitable container. E.g.4ml of wash solution with 96ml of deionized water=100ml, mix thoroughly for 15 seconds.
- Stability: up to 30 days at 2…8oc.

Specimen preparation

- Once serum is separated from venous blood by using centrifugation, it was stored at -20oc until tested.
- The dilute patient's sera 1part with 100 parts of diluents.e.g.10µl serum mix with 1ml diluents mix thoroughly (15 sec).
- Diluted samples were used on the same day and PC, NC, and CC are ready for use and mix for 5 seconds.

Test Procedure

Step 1

- Label the plate as Blank[A],and sample wells
- Add 100 µl of NC[Negative Control] in duplicate to B1and C1 wells
- Add 100 µl of Cut Off Control and Positive Control in duplicate to D1-G1 wells
- Place 100 µl of diluted serum samples to labeled sample wells
- Mix carefully for 5 seconds and cover the plate with adhesive strips
- Incubate 30 min at 37 oc
- Wash all plate 4 times by adding 300 µl to each wells.

Step 2

- Add 100 µl working conjugate solution to all plates except blank well
- Mix carefully for 5 seconds and cover the plate with Adhesive strips
- Incubate the plates for 30 minutes at 37 oc
- Wash the plates 4 times by adding by adding 300 µl to each well

Step 3

- Add 100 µl substrate to all wells
- Incubate the plate for 30 minutes at 37oc
- Stop the reactions by adding 100 µl stop solution to each wells and mix carefully
- Measure the absorbance at 450nm as soon as possible or within 10 minutes

Calculation of Control values and cut-off

Consider the OD of the blank (A1) and calculate mean absorbance values of NC in well B1 and C1(MNC),CC IN wells D1 and E1(MCC) and PC in wells F1 and G1(MPC) according to

$$MNC=\frac{A450\ (B1) + A450(C1)}{2}$$ where MNC refers Mean of Negative Control

$$MCC=\frac{A450\ (D1) + A450(E1)}{2}$$ where MCC refers Mean of Cut Off Control

$$MPC=\frac{A450\ (F1) + A450(G1)}{2}$$ where MPC refers Mean of Positive Control

Cut-off value COV=MCC

The test run may be considered valid provided that the following criteria are met

MNC<0.150

MCC>0.200

MPC/COV≥2.0

A450 Blank≤0.100

Interpretation of results

Results	Interpretation
A450(Specimen) <COV-10%	*Toxo-IgM-Ab-Nonreactive*
A450(Specimen) >COV+10%	*Toxo-IgM-Ab-reactive*
A450(Specimen) ≥COV-10% and A450(Specimen) ≤COV+10%	Equivocal: retest In case of repeated equivocal result patient monitoring is recommended to exclude unspecific reaction or cross reaction
Unexpected level of controls or Known samples	Invalid(procedural error):Retest

Reference:**www.human.de/data/gb/vr/el-toxomμ.pdf**

Annex IX.Curriculm vitae [CV] of Principal investigator and Advisors

Name **Anteneh Hailu Abebe**

Address:

Work place **Residence**

Department of Microbiology, Immunology and Public Health Yeka sub, woreda 10, kebele 12

Addis Ababa University, School of veterinary medicine House # .619, Addis Ababa

P.O.Box, 34, Addis Ababa, Ethiopia Mobile No. [00]251-910140762/0912929930

Date and Place of Birth: March 4, 1986; Debre Sina, Ethiopia

Nationality: Ethiopian

Marital status: Married, one daughter

Current Position **Assistant lecturer and Researcher, School of Veterinary Medicine**

Addis Ababa University

Academic Qualification

2006, July. BSc, Medical laboratory Technology, College of Health Sciences, Haramaya University **[Distinction]**

2005 July. Ethiopia school Leaving Certificate Examination [ESLCE] **[Distinction]**

1992-2005. Elementary and Secondary Education, Ankober, Alu Amba, and Debre birhan, Ethiopia

Training/Certificate

2008: Basic computer skill training, School of Medicine, AAU

2009: Project cycle Management, School of Social Sciences, AAU

Academic and Research Appointments

2009 sept-June2012, June.Msc Student: Department of Clinical Laboratory Science, School of Medicine, Addis Ababa University, Ethiopia

2009 Dec-Present, Coordinator, Immunology and virology Research Laboratories, Collage of Health Sciences,School of veterinary medicine

2009 sep-2009 Sep: Chairperson, Department of Medical laboratory technology and student Dean of Addis Ababa medical college

2008 Sept-present: Assistant lecturer; Addis Ababa University, school of vet medicine, Department of Microbiology, Epidemiology and Public Health, Ethiopia

2007 Sept-2008, Augest; Academic Dean, Pharma Health Science College, Shashemena, Ethiopia

Research Experiences

2011 Sept-2011 June.MSc thesis Research: Seroepidemology of Toxoplasmosis in women and Its Public Health Importance in three districts of central Ethiopia. [The Grant is AAU]

2005 Dec.-2007, Jan.BSc Thesis Research: Comparastion of Physical Examination and HGB determination in diagnosis of Anemic and HIV/AIDS patients in Dilechora Hospital, Dire Dawa

Teaching Experiences

- **Courses thought at School of vet Medicine, Addis Ababa University**
  - ✓ Microbiology I, Immunology, parasitology,
  - ✓ Clinical lab. Medicine

- ✓ Instrumentation,
- ✓ General and Diagnostic bacteriology

❖ **Courses thought at Different Private College**

- ✓ Immunological and biological products
- ✓ Health service management
- ✓ Health Education,Biostatistcs,Epidemology,
- ✓ Hematology,Immunohematology,Cinical chemistry,Bacteriology,Urinalysis

Research publications

- õ **Anteneh Hailu**,Comparastion of Physical Examination and HGB Determination in diagnosis of anemic and HIV/AIDS patients in Dile chora Hospital, Dire Dawa [collaborative research].inpress

Exceptional Qualities

Able to work for long hours and under-pressure, ability to produce simple, clear and high quality products within a short period of time, good analyst of available information for evidence-based decision.

Professional society

Member, Ethiopia Medical Laboratory Sciences

Member, Ethiopia Public Health Association

Languages:	**Oral Level**	**Written Level**
Amharic [Ethiopian]	Advance [Fluent]	Advance [Fluent]
English	Advance [Fluent]	Advance [Fluent]

Reference

❖ Dr.Tesfaye Sisay [PhD],ChairPerson,Departement of Microbiology, Immunology and Public Health,AAU.+251-910,304449 ,Tesfu@yahoo.com

❖ Merga Bakana /DVM,FRVS,PHD,Professor/,Dean of Faculty of vet Medicine, Addis Ababa University

Curriculum Vitae

Full Name: Kassu Desta Tullu

Date Of birth: 1976 G.C.

Place of birth: Addis Abeba, Ethiopia

Nationality: Ethiopian

Address: P.O. BOX: 11331, ***Tel***. Res: 251-114-66-29-89, *Office*: 251-112-75-51-70

Mobile: 251-0911-10-70-99, **e.mail** : kassudesta2020@gmail.com

Home Institution: Addis Abeba, University, Faculty of Medicine, School of Medical Laboratory Technology. P.O.Box: 9086 A.A., Ethiopia

Qualification:

MSC in Medical Microbiology in 2006 G.C.

Work Experience: 12 years total, laboratory services and academic

- ✓ Lecturer in School Of Medical Laboratory Technology; Faculty of Medicine; Addis Ababa University.[Since August, 3,2006] and Par timer laboratory personnel in United Nation Health Care Center [UNHCC] since December ,2004
- ✓ Assistance lecturer at School of Medical Laboratory Technology, Faculty of Medicine, Addis Abeba University [2004- August 3 ,2006]
- ✓ Graduate assistance at School of Medical Laboratory Technology, Faculty of Medicine, Addis Abeba University [2002-2004] and partimer laboratory Technologist in private laboratories.
- ✓ Senior laboratory technicians at Department of Biochemistry, Faculty of Medicine, Addis Abeba University [1997-1998]: assisting staff research and guiding biochemistry practical classes for medical students.
- ✓ Junior laboratory technician at Department of Medical Biochemistry [1996-1997] Faculty of Medicine, Addis Abeba University [1997-1998]: assisting staff research and guiding biochemistry practical classes.

Current responsibility: Head Department of Clinical Laboratory Management and Quality assurance.

Membership of professional Association: Ethiopian Public Health Association, Ethiopian Medical Laboratory Association.

Publications: 1.Kassu Desta , Fetene Derbe, Daniel Asrat: .Seroprevalnce of Helicobacter pylori infection among health Blood donors in Addis Abeba, Ethiopia. Ethiop J Health Sci.2002: 12: 2: 109-115.

2. Tesfahun G, Kassu Desta, Yohannes Mengistu, Daniel Asrat.: Seroprevalence of Helicobacter pylori Infection in and its Relationship with ABO blood Groups. *Ethiop. J. Health Dev*. 2005: 19:1: 55-59.

3. Kassu Desta, Mekdes Gebeyehu, Eshetu Lemma, Biniyam Feleke Daniel Asrat.: Comparison of BACTEK MGIT 960 and Lowenstein-Jensen Medium for detection and recovery of Mycobacteria from Smear Negative Specimens Recent Advances and Research Updates: 2008: ISSN-0972-4699 :9: 1: 105-113 .

4. Desta Kassu; Asrat Daniel; Lemma Eshetu; Gebeyehu Mekdes; Feleke Beniam. Prevalence of smear negative pulmonary tuberculosis among patients visiting St. Peter's Tuberculosis Specialized Hospital, Addis Ababa, Ethiopia.Ethiopian medical journal 2009;47[1]:17-24.

5. Kassu Desta, Daniel Asrat, Eshetu Lemma, Mekdes Gebeyehu, Beniam Feleke,Drug Susceptibility of Mycobacterium tuberculosis isolates from smear negative pulmonary tuberculosis patients, Addis Abeba, Ethiopia. Ethiop. J. Health Dev. 2008; [22] [2] : 212-215

6. Fisseha Walle, Daniel Asrat, Atnaf Alem, Enyew Tadesse, Kassu Desta Prevalence of Hepatitis B Surface Antigen among pregnant women attending Antenatal care service at Debre-Tabor Hospital , NorthWest Ethiopia

Articles sent for publication:

Asfaw Adane, Aknanaw Bezabih, Anteneh Gasahye, Desta Kassa, Kassu Desta

HIV Associated anaemia before and after Initatation of Antiretroviral Therapy in the ART center of Minilik II Hospital , Addis Abeba, Ethiopia

Gizachew Tadesse, Abebe Habteselassie, Kassu Desta, Samuel Esayas, Abate Bane.Association Of Dyspepsia Symptoms and Helicobcater pylori infections in Private Higher Clinic, Addis Abeba , Ethiopia

Geme Urge, Kassu Desta, Ibrahim Ali, Abera Hirko, Getahun Mekuria.Prevalence of Hookworm Infcetions and it's association with Anaemia among patients visiting Fenanan Medical Center, East Wolega Zone, Ethiopia

Course handling: Medical Microbiology; Medical Virology; Hematology, Laboratory Quality Assurance; Public health bacteriology, Immunology and Serology; Clinical Chemistry.

Other curricular activities

Curriculum development for health science students, Jimma University [For degree students] [2001]

Curriculum development for health science students, organized by Ministry of Education [2003]

Review of lecture notes prepared by Carter center:-

i. Medical Bacteriology
ii. Clinical Chemistry
iii. Clinical Methods for health officers

Workshop participation: Ethiopian Medical Association annual conferences, Ethiopian Public health Association annual conferences, Ethiopian Medical Laboratory Association coordinator of annual conferences, paper presentation.

References

1. Dr. Yesehak Worku: Associate Prof. of Biochemistry; Faculty of Medicine, Department of Medical Biochemistry, Addis Ababa University. P.O.BOX-9086 Addis Abeba, Ethiopia

Mobile: +[251]911 57 20 95/ + [251] 113 72 74 11

e.mail: yesehakw@yahoo.com

2. Dr. Daniel Asrat: Associate Professor of Medical Microbiology; Faculty of Medicine; Department of Medical Microbiology; Parsitology and Immunology; Addis Ababa University. P.o.Box: 9086, Addis Abeba, Ethiopia

e.mail: asratdaniel@ethionet.et

Mobile: +[251] 911 22 30 19

3. Mr Gonfa Ayana Senior researcher at Ethiopian Nutrional and Health Research Institute, Head of Clinical Chemistry Laboratory and quality assurance

Mobile: + [251] 911 21 57 43 or + [251] 911 895959

Tesfaye Sisay Tessema/PhD, Associate professor/

Work Place

Department of Microbiology, Epidemiology&Public HealthAddis Ababa University, School of Veterinary Medicine

P.O.Box 34, Debre Zeit, Ethiopia

Residence

Yeka Kifleketema,Woreda 10, Kebele 17, House No. 432, Addis Ababa, Ethiopia

1. Personal Data

Date and place of Birth: March 14, 1974; Dessie, Ethiopia.

Nationality: Ethiopian

Marital status: Married, two children.

Sex: Male

2. Education

2008, Dec.PhD, **Immunology** [Research area], Institute of Medical Microbiology and Hygiene, Johannes Gutenberg-University of Mainz, Germany, in the group of Prof. Dr. F. Petry.*"Summa cum laude" [Very good]*

2002, Sept.MSc, **Molecular Biology**, Interuniversity Program in Molecular Biology, Catholic University of Leuven, Leuven, Belgium. *"Cum laude" [Distinction]*

1997, July.Doctor of Veterinary Medicine[D.V.M.], Addis Ababa University [AAU], Faculty of Veterinary Medicine, DebreZeit, Ethiopia. *[Distinction]*

1991. Distinction, Ethiopian School Leaving Certificate Examination [ESLCE]

1981 J **1991.** Elementary and Secondary Education, Dessie, Ethiopia.

Training/ Certificates

2011, December 19-23. Certificate, Ethics in Health Research Ethics and standard operating procedures [SOP] Training, College of health sciences, AAU, Ethiopia.

2011, November 18-20. Certificate, Leadership training organized by leadership and management capacity development project, Adama, Ethiopia.

2010, August SAS software training, School of veterinary medicine, AAU

2004. Certificate, Training of trainers on HIV/AIDS – Organized by Integrated service for AIDS prevention and support organization [ISAPSO], Addis Ababa, Ethiopia.

1998, August 6-17. Certificate, Teaching-learning workshop, AAU, DebreZeit, Ethiopia.

3. Academic and Research Appointments

2012, March. - Present. Associate Editor-in-Chief, Ethiopian Journal of Veterinary Medical and Animal Sciences [Eth.J.Vet.Med.&Anim.Sc.] – Organ of School of Veterinary Medicine, Addis Ababa University, DebreZeit, Ethiopia.

2009, Aug - present. **Chairperson**: Department of Microbiology, Immunology, Epidemiology & Public Health, Faculty of Veterinary Medicine, Addis Ababa University.

2009, Aug - present. **Coordinator**: Graduate programs in the Department - PhD Program in Veterinary Public Health; MSc program in Veterinary Microbiology; and MSc program in Veterinary Public Health.

2010, July – present. Local project coordinator: Promotion of the PhD Program in Veterinary Public Health at the Faculty of Veterinary Medicine, Addis Ababa University, Funded by VLIR-UOS, Belgium. Principal investigator: **Prof. Dr. B. Goddeeris,** Catholic University of Leuven, Leuven, Belgium.

2009, July – 2010, Jan. Member, curriculum revision and design committee for MSc program in Veterinary Microbiology of the Department mentioned above.

2009, Jan. – present. Assistant Professor: Addis Ababa University, School of Veterinary medicine, Department of Microbiology, Epidemiology and Public Health, Ethiopia.

2006, March J 2008, Dec.PhD student: Institute of Medical Microbiology and Hygiene, Johannes Gutenberg-University of Mainz, Mainz, Germany.

2004, Nov J 2006, March.Research assistant: Hannover Medical School, Institute of Gastroenterology and Hepatology, in the group of Prof. U. Seidler, Hannover, Germany.

2003, – 2004, Nov.**Assistant Registrar**: Faculty of Veterinary Medicine, Addis Ababa University.

2003, Oct – 2004, Nov.Assistant Professor: Addis Ababa University, Faculty of Veterinary medicine, Department of Microbiology and Veterinary public health, Ethiopia.

2002, Oct – 2003, Oct.Lecturer: Addis Ababa University, Faculty of Veterinary medicine, Department of Biomedical Sciences, Ethiopia.

2000, Oct – 2002, August. Masters student: Interuniversity Programme in Molecular Biology, Belgium.

1998, March J 2000, Sept. Assistant lecturer: Addis Ababa University, Faculty of Veterinary Medicine, Department of Anatomy & Embryology, Ethiopia.

5. <u>Committees</u>

2011, Nov. – present. Member and secretary, Institutional Review Board [IBR] [or, Ethical Clearance Committee] of School of Veterinary Medicine.

2009, Aug. – 2010, Jan. Member, Faculty modular MSc curriculum assessment committee.

2009, Aug. – 2010, Jan. Chairman, Department modular masters curriculum review committee.

2009, March – 2009, June. Member, Technical evaluation committee for purchase of laboratory equipments from foreign bidders.

2009, Aug. – present. Member, Academic commission of School of Veterinary Medicine, AAU.

2009, Aug. – present. Member, Departmental graduate committee [DGC].

2009, Dec. – 2010, July. Chairman, Procurement of equipments, facilities and furniture.

2004. Member, Discipline committee.

2002. Oct – 2004, Nov; Sept, 2009 – Nov, 2010. Member, Auction committee.

2003 – 2004. Chairman, Disposal committee for chemical and equipment wastes at SVM.

2002, Oct – 2004, Nov. Member, National biosafety council of Ethiopia.

1997. Secretary, Graduation magazine committee.

6. <u>Research Experience</u>

2009, Jan. – present.I participate actively in advising seminar and thesis works of undergraduate and MSc students, working on different aspects of animal and zoonotic infectious agents. Lately, I am involved in advising PhD students as well.

2006, March J 2008, Dec.Doctoral thesis research: 'Host immune response in immunodeficient mice against infection with *Cryptosporidium parvum*'. Institute of Medical Microbiology and Hygiene, Johannes Gutenberg-University of Mainz, Mainz, Germany.

2004, Nov J 2006, March. Molecular Mechanisms of inflammatory diarrhea using IL-10KO mouse model of chronic intestinal inflammation; Hannover Medical School, Institute of Gastroenterology and Hepatology, in the group of Prof. U. Seidler, Hannover, Germany.

2002, Oct – 2004, Nov. Research on bacterial flora of the respiratory tract in sheep and goats.

2001, Oct – 2002, August.Masters thesis research: 'The study of growth hormone receptor gene expression in the immune tissues and cells of chicken: the role of growth hormone in the immune system.' Catholic University of Leuven, Faculty of Agricultural and Biological Sciences, Laboratory of Immunology and Physiology of domestic animals, in the group of Prof. Dr. B. Goddeeris.

1998, March J 2000, Sept. Research on bacterial flora of the respiratory tract in small ruminants.

1996, Oct – 1997, May.Undergraduate [DVM] thesis work: 'Isolation and serotyping of *Mannheimiahemolytica* and *Pasteurellatrehalosi* serotypes from sheep,KombolchaZonal Veterinary Laboratory, Kombolcha, Ethiopia.'

7. Teaching Experiences

Courses/ modules Delivered at School of Veterinary Medicine, Addis Ababa University

Undergraduate DVM program [courses]

Molecular Biology and Immunology; Veterinary Immunology; Veterinary Microbiology I [Bacteriology and Mycology]

MSc Programs in Veterinary Microbiology; Veterinary Public Health, Animal Production & Health [Courses & Modules]

Advanced Diagnostic Microbiology; Molecular Biology; Advanced Veterinary Microbiology; Microbial Genetics and Pathogenesis; Cellular and Molecular Immunology; Advanced Microbiological Diagnostic Methods; Advanced Food Microbiological Methods and Assays; Biotechnology in Animal Production

PhD Programs in Veterinary Public Health, Veterinary Parasitology; Animal Production [Courses]

Advanced Food Microbiological Methods; Parasite Immunity; Biotechnology in Animal Production

Courses/ modules taught at other academic institutions [Guest instructor]

Advanced Molecular Biology and Immunology - MSc Program in Veterinary Epidemiology [2010; Jimma University, School of Veterinary Medicine, Jimma, Ethiopia]

8. Advising graduate and undergraduate students

PhD students [4]; Diploma thesis students [in Germany] [2]; MSc thesis students [22]; DVM thesis students [16]; VLT students [12]

9. Professional Activities

2011, December – To Date. General Manager, One Health Integrated Service P.L.C.

2011, Feb.Consultant, Training material preparation – Maintenance in Laboratories for P1 &P2.

i. Student thesis committee [Year degree awarded; Affiliation]

HaileyesusAdamu – PhD [2010; Department of Biology at AAU]

Internal assessment of MSc graduating students [June 2009; June 2010, June 2011 - School of Veterinary Medicine, AAU]

ii. External examination [oral defense] committee for DVM graduating students

2010, June Awassa University, Department of Veterinary Medicine, Awassa, Ethiopia

2011, June Awassa University, Department of Veterinary Medicine, Awassa, Ethiopia

iii. External examination of DVM undergraduate students

2009, June and 2011, June Course of Veterinary Microbiology; Faculty of Veterinary Medicine; Gonder University, Gonder, Ethiopia.

iv. External reviewer of postgraduate curriculum

2011, May Curriculum of MSc Program in Veterinary Microbiology, College of Veterinary Medicine, Haramaya University, Haramaya, Ethiopia

10. Research Grants

Principal Investigator: "Investigation of camel diseases in Ethiopia and development of intervention strategies" **Since 2010, Dec. 1st AAU Thematic Research Grant.**

Collaborator: "Microbial zoonoses" **Since2010, Dec. 1st AAU Thematic Research Grant.**

Collaborator: "Traditional medicinal plants" **Since2010, Dec. 1st AAU Thematic Research Grant.**

Principal investigator: 2009 – 2011."Promoting food security through processing and marketing of camel milk in the pastoral areas of Ethiopia", funded by National Agricultural Research Fund Grant, Addis Ababa, Ethiopia.

Co-investigator: 2009 – 2011. "Emerging aetiologies of camel respiratory diseases", funded byNational Agricultural Research Fund Grant, Addis Ababa, Ethiopia.

Co-investigator: 1999 – 2000. "Study on bacterial flora of the respiratory tracts of sheep and goats" funded by Research and publication office of Addis Ababa University.

11. Publications:

10. Mahendra Pal, **TesfayeSisay**, YilkalAsfaw**[2011]**: Growing significance of fungi in human and animal health. ***Journal of Natural History; 7[2]: 82-86.***

9.NesibuAwol, GelagayAyelet, ShiferawJenberie, EsayasGelaye, **TesfayeSisay** and HaileleulNigussie**[2011]**: Bacteriological studies on pulmonary lesions of camel [*Camelusdromedarius*] slaughtered at Addis Ababa abattoir, Ethiopia.***African Journal of Microbiology Research; 5[5]: 522-527***.

8.GezahegneMamo, GizachewBaylegne, **TesfayeSisayTessema**, MengistuLegesse, GirmayMedhin, Gunnar Bjune, FekaduAbebe, GobenaAmeni. **[2011]**: Pathology of camel tuberculosis and molecular characterization of its causative agent in Pastoral Regions of Ethiopia. ***PLoS ONE; 6[1]: e15862***.

7. Franz Petry, Vera Jakobi, **Tessema T.S. [2010]**: Host immune response to *Cryptosporidium parvum* infection. ***Experimental Parasitology; 126: 304–309***.

6. Tessema T.S., Dauber E., Petry F. **[2009]**: Adoptive transfer of protective immunity from *Cryptosporidium parvum*-infected interferon-gamma and interleukin-12-deficient mice to naive recipients. ***Vaccine; 27: 6575 – 6581.***

5. Tessema T.S., Schwamb B., Lochner M., Förster I., Jakobi V., Petry F. **[2009]**. Dynamics of gut mucosal and systemic Th1/Th2 cytokine responses in interferon-gamma and interleukin-12p40 knockout mice during primary and challenge *Cryptosporidium parvum*infection.***Immunobiology; 214[6]: 454 – 466***.

4.Petry F., Jakobi V., Wagner S., **Tessema T.S.**, Thiel S., Loos M. **[2008]**. Binding and activation of human and mouse complement by *Cryptosporidium parvum* [Apicomplexa] and susceptibility of C1q- and MBL-deficient mice to infection. ***Molecular Immunology.2008; 45[12]: 3392-400***.

3.Seidler U., Lenzen H., Cinar A., **Tessema T.**, Bleich A, Riederer B. **[2006]**. Molecular mechanisms of disturbed electrolyte transport in intestinal inflammation.***Ann N Y Acad Sci.;1072: 262-75***.

2.Megra T., **Sisay T.**, and Asseged B. **[2006]**. The aerobic bacterial flora of the respiratory passageways of healthy goats in Dire Dawa abattoir, Eastern Ethiopia.***Revue Med. Vet.157 [2]: 84 – 87***.**

1. Sisay T. and Zerihun A. **[2003]**. Diversity of *Mannheimiahemolytica* and *Pasteurellatrehalosi* serotypes from apparently healthy sheep and abattoir specimens in the highlands of Wollo, North East Ethiopia. ***Veterinary Research Communication, 27: 3*** J ***14***.

12. Abstracts, Posters, Oral presentations on scientific meetings

1. Tessema T.S., Schwamb B., Jakobi V., Petry F. [2008]. Dynamics of gut mucosal and systemic Th1/Th2 cytokine responses in IFN-γ and IL-12KO mice during *Cryptosporidium parvum* infection and challenge infection.***11th German Meeting on Th1/Th2 Research, German society of Immunology, June 18 – 19th 2008***, Marburg, Germany. **Oral presentation**.

2. Tessema T.S., Schwamb B., Jakobi V., Petry F.[2008].Dynamics of gut mucosal & systemic Th1/Th2 Cytokine responses inIFN-gamma and IL-12p40KOmice during *C. parvum* Infection.***23rd Meeting of the German Society for Parasitology, March 5 – 7th 2008***, Hamburg, Germany. **Poster**.

3. Schwamb B., **Tessema T.S.**, Lochner M., FörsterI., Petry F. [2008]. Influence of IL-18 on the systemic and local immune response to *Cryptosporidium parvum* infection in IFN-γKO and IL-12KO mice. ***23rd Meeting of the German Society for Parasitology, March 5 – 7th 2008***, Hamburg, Germany. **Poster**.

4. Tessema T.S., Jakobi V., Petry F., [2007]. Cytokine responses of mice after primary infection and re-challenge with *Cryptosporidium parvum*.***Statusworkshop of the German Society of Hygiene and Microbiology [DGHM]-Fachgruppe"Eukaryotic Pathogens", February 23 – 24th 2007***, Stuttgart, Germany.**Oral Presentation**.

5.Jakobi V., Stumm C., **Tessema T.S.**, Petry F. [2007]. Differential expression of *Cryptosporidium parvum* genes *in vitro* and *in vivo*.***1st Three Countries Joint Meeting- Living Together.Physiopathology of intracellular parasitic diseases, June 14*** J ***16th 2007***, Strasbourg, France.**Poster**.

6. Jakobi V., **Tessema T.S.**, Kneib I. & Petry F. [2006]. Evaluation of interferon-gamma and interleukin-12 knockout mice as models for the development of vaccination strategies against cryptosporidiosis. 3. ***Annual Workshop of the COST Action 857, March 17 J 20th 2006***, Dresden, Germany. **Poster**.

7.**TessemaT**., CinarA., RiedererB., BleichA., WestendorfA., BuerJ., SeidlerU. [2006]. Alterations of Expression and function of the Na^+/H^+ exchanger NHE3 during early inflammation in IL-10 knock out murine intestine. ***Joint Meeting of The German Society of Physiology and The Federation of European Physiological Societies, 26/03/2006-29/03/2006***. Ludwig-Maximilians-University, Munich.***ActaPhysiologica 2006*; 186, Supplement 650.**

8. Tessema T., Lenzen H., Cinar A., , Bleich A, Riederer B., Seidler U. [2005].Expression of the PDZ-Adapter protein PDZK1 and the Na^+/H^+ exchanger NHE3 during early inflammation in IL-10KO Mouse.***International symposium on Inflammatory Bowel Disease- Research Drives Clinics [IBD2005]***.Münster, Germany. **Abstract and poster**.

9. Tessema T. [2005]: Disturbances in the mRNA expression patterns of Na+/H+ exchanger3 [NHE3] and its adapter proteins in IL-10KO mouse model of Inflammatory Bowel Disease [IBD]. ***Annual German association of Gastroenterologists held in Köln***, Germany.**Oral presentation**.

13. Professional Societies

Member, Ethiopian Veterinary Association [EVA]. 2003 – present.

14. Honors, Awards, Scholarships

2006, Feb -2008, Dec. PhD research funded by German Research Foundation [DFG] Collaborative Research Center [SFB 490] "Invasion and Persistence of Infectious Agents" project D7, in the Group of Prof. Dr. F. Petry.

2000, Sept – 2002, Oct. Scholarship from the Belgium development cooperation [VLIR] for my master's degree study in Belgium.

1997, July. Addis Ababa University Gold medal winner as best of the 1997 DVM graduates.

15. Other Skills and Experiences

- Excellent knowledge and practical experience in word processing, spreadsheet and data base management and data analysis software [Ms WORD, Ms EXCEL, Ms Power point, and SPSS, Adobe PhotoShop].

- Strong background and experience in working with multidisciplinary environment, excellent communication skill with people of diverse ethnics and nationalities of different cultural practices.

16. Languages

English and Amharic [Written, listening, spoken and reading]; German [basic].

17. References

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PERSONAL DATA

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Place of birth: Mesela [West Harerghe], Ethiopia

Date of birth: August 1, 1965

Citizenship: Ethiopian

Marital status: Married

Children: 3 daughters and a son.

Language: English, Amharic and Oromiffa

EDUCATIONAL BACKGROUND

- 1970 – 1971: Mesela Kindergarten School, Messela, western Hararghe
- 1972 – 1979: Mesela Primary and Junior Secondary School, Mesela, western Hararghe
- 1980 – 1982: Harar Medhanealem Comprehensive Secondary School [grade 9 to 11], Harar, Eastern Hararghe
- 1983- Dire Dawa Comprehensive Secondary School, Dire Dawa [grade 12]- awarded certificate
- 1984 – 1989: Addis Ababa University, Faculty of Veterinary Medicine, awarded DVM [Doctor of Veterinary Medicine] degree –**Silver medal winner**
- June 18-29, 1990: Attended short course about "Introduction to Applied Statistics for African Animal Scientists", ILCA, Addis Ababa, awarded certificate

- August 5-27, 1991: Attended short course on “Teaching and Learning”, Debre Zeit, Ethiopia, awarded certificate
- August 1992 to June 1993: Larenstein International Agricultural College, The Netherlands, awarded Postgraduate Diploma in Tropical Animal Production- **First standing**
- September 2002 to August 2004: Addis Ababa University, Faculty of Veterinary Medicine, awarded MSc in Tropical Veterinary Medicine [Veterinary Public Health option]- **First standing]**
- August 19 to 23, 2002: Managing and administering higher Education in Ethiopia, organized by Ministry of Education in collaboration with The British Council Ethiopia. Awarded certificate
- Diploma in Basic Computer training [adequate skill on word processing, spreadsheet and database]
- Certificate of active participation in the university curriculum development process during the academic year 2007/2008
- Certificate of attendance and successful completion of short course in use of Statistical Package for Social Sciences [SPSS] Software, November, 2007.
- Certificate on "Gender Responsive Pedagogy" training Conducted at Jimma University, Ambo College, organized by FAWE-Ethiopia chapter in collaboration with FAWE Head Quarter, Nairobi, Kenya [April 26 to 28, 2007.
- Certificate of International English Language Test [IELT] from British Council, testing date July 11, 2009, Score overall band = 6.0 [6.5 in writing and speaking each].
- Currently PhD student at Addis Ababa University, first year complete

EMPLOYMENT RECORD AND POSITIONS

- Date of employment: September 1989GC
- Post: Assistant lecturer and veterinarian from September 1989 to August 1990
- From September 1990 to June 2004 lecturer and veterinarian
- From July 2004 up to now assistant professor
- Employer: Ministry of Education and Ambo University

TASKS:

- Offering lecture in the field of Animal health and disease control from 1989 up till now and apiculture from1999- 2002. I have thought Introduction to Animal Breeding & Animal Feed & Nutrition courses at time of manpower shortage in the department. Currently I offer the following courses for degree students: Veterinary parasitology, Food Hygiene and Veterinary Public Health, Microbial Diseases, Microbiology, Epidemiology, Principles of Pharmacology and toxicology and Practical Animal Production and Health
- Veterinarian in charge of Ambo College's dairy, beef, poultry, sheep and bee farms
- Initiator and developer of ox fattening project at Ambo College of Agriculture & responsible person for health & routine management aspects since 1995.
- Head of Department of Animal Sciences from Feb. 1998 to Jan. 2000.
- Head of the Registrar Office from Feb. 2000 to September 2002.
- Starting from October 15, 2004 up to September 2009- Director for Continuing and distance Education Program of Ambo University.
- Currently PhD student in Veterinary Public Health at Addis Ababa University, School of Veterinary Medicine.

PROJECT AND MANUAL DEVELOPMENT WORK EXPERIENCE

- Developed project, together with department members, about practical training in bee keeping & small-scale poultry production for disabled individuals [FAO Sponsored]
- Developed project on beekeeping for Mugher Cement Enterprise in August 2000
- Provide community service in the area of livestock health, production and management for the surrounding small-scale farmers and private investors.
- Developed curriculum to start BSc in Veterinary Laboratory Technology at Ambo University
- Developed course manuals such as
    - Endrias, Z. [2005]: **Instructional Manual on Animal Health and Disease Control"**, Jimma University, Ambo College, Department of Animal Production and Health.
    - Endrias, Z. [2004]: **Beekeeping Reference Manual**, Jimma University, Ambo College, Department of Animal Production and Health.

- Endrias, Z. [2006]: **Instructional Manual on Major Livestock Diseases in Ethiopia**, Jimma University, Ambo College, Department of Animal Production and Health
- Endrias, Z. [2009]: **Instructional Manual on Veterinary Parasitology**, Ambo University College, Department Of Veterinary Laboratory Technology
- Endrias, Z. [2007]: **Food Hygiene and Veterinary Public Health Distance Module for degree students**. Ambo University College, Ambo, PP 241

Thesis

- **Endrias Zewdu** [1989]. Sero-prevalence study of bovine brucellosis in selected sites of Sidamo region, DVM thesis, FVM, AAU.
- **Endrias Zewdu [2004].** Prevalence, Distribution And Antimicrobial Resistance Profile Of *Salmonella* Isolated From Food Items And Personnel In Addis Ababa, Ethiopia, MVSc thesis, FVM, AAU.

Research publications

- Pilot study on bovine tuberculosis in cattle and its implication in man in selected sites of Ethiopia [collaborative research]
- **Endrias, Z.,** Bayleyegn, M., Mogessie, A. Muckle, A. [2004]. Prevalence and Distribution of *Salmonella* Serotypes isolated from Food Items and Personnel in Addis Ababa, Ethiopia, *Ethiop. Vet. J*. 12 [2]: 1683 – 6324.
- **Endrias, Z**., and Poppe, C. [2009]. Antimicrobial Resistance Pattern of *Salmonella* Serotypes Isolated from Food Items and Personnel in Addis Ababa, Ethiopia. *Trop Anim Heealth Prod* **41**: 241 – 249. *DOI 10.1007/s11250-008-9181-y*.
- **Endrias Z**., Yechale, T., and Assefa, M. [2010]. Bovine Hydatidosis in Ambo Municipality Abattoir, West Shoa, Ethiopia, *Ethiop. Vet. J.*, 14[1], 1 – 14.
- **Endrias Z.**, Yohannes S., and Berhanu M., [2010]: Prevalence of helminth parasites of dogs and owners awareness about zoonotic parasites in Ambo town, central Ethiopia. *Ethiop. Vet. J*., 14[2], 17 – 30.
- **Endrias Zewdu [20101].** Prevalence of Ovine and Caprine Oestrosis in Ambo, Ethiopia, *Trop Anim Heealth Prod.* **43**[1]:265-270. DOI 10.1007/s11250-010-9687-y

- Abebayehu T., Endris F., Berhanu M., Rahmeto A. and **Endrias** Z. [2010]. Study On The Prevalence Of Ectoparasite Infestation Of Ruminants In And Around Kombolcha And Damage To Raw And Wet Blue [Pickled] Goat Skin At Kombolcha Tannery, North Eastern Ethiopia. *Ethiop. Vet. J*. [accepted]

EXTRA CURRICULAR ACTIVITIES

- Member of Research, Extension & publication Committee from 1995 – 2001.
- Member of Curriculum Review & Development Committee form 1997 – 2001.
- Chairman of Credit & Saving Association from 1994 – 1996.
- Chairman of Discipline Committee 1997 – 1999.
- Member of Farm Management Technical Committee: 1998 – 2000.
- Served the college in several Ad-hoc Committees.

MEMBERSHIPS TO SCIENTIFIC SOCIETIES

- Ethiopian Veterinary Association [EVA]
- Ethiopian Society of Animal Production [ESAP]

HOBBIES

- Reading, music, indoor games and tour

CONTACT PERSONS

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Declaration

"I, the under signed, declare that the thesis is my original work and has not been presented for a degree in any university and that all sources of materials used for the thesis have been dully acknowledged"

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This thesis has been submitted for examination with our approval as University academic Advisors.

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Signature _____

Place: School of Veterinary Medicine, Addis Ababa University, Ethiopia

Dr.Endrias Zewede [DVM. Dip [TAP] MVSc. Associate Professor]

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Place: School of Veterinary Medicine, Addis Ababa University, Ethiopia