

**PREVALENCE OF TOXOPLASMOSIS AMONG SUSPECTED  
FEMALES IN EGYPTIAN HOSPITAL MOGADISHU SOMALIA**

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## DECLARATION A

Researchers declared this thesis is their original work and has not been presented for a degree or and other academic award in any university or institution of learning.

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**DECLARATION B**

This thesis entitled “**prevalence of toxoplasmosis among suspected females in Egyptian hospital in Mogadishu Somalia**.” Prepared and submitted by **Ubah Abdisalaan Mohamed Yuusuf, Tusmo Abdullahi Mohamed Awale**, graduated fulfillment of requirements for the degree of Bachelor of Medical laboratory science.

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## **DEDICATION**

The researchers dedicates this thesis their parents, brothers, sisters and friends with much love, for any effort and sacrifice they provided throughout their academic life and career development, also for being supportive to the researchers spiritually, emotionally and morally.

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First and foremost, all praise to almighty Allah the most merciful and the most compassionate that enabled us to complete this proposal, this proposal was nerve merely our own work and our ability but, combined efforts. We are very grateful to our dear parents and also, we wish to thank all staffs in Somali International University SIU. We deeply appreciate and thank my supervisor

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## TABLE OF CONTENT

DECLARATION A .....	II
DECLARATION B .....	III
DEDICATION .....	IV
ACKNOWLEDGMENT.....	V
TABLE OF CONTENT .....	VI
ABBREVIATIONS .....	IX
.Abstract .....	X
CHAPTER ONE .....	1
INTRODUCTION .....	1
1.0 Introduction .....	1
1.1 Background .....	1
1.2 Problem statement .....	3
1.3 Objectives of the study .....	4
1.3.1 General Objectives .....	4
1.3.2 Specific Objectives .....	4
1.4 Research question.....	4
1.5 Scope of study .....	4
1.6 Significance of the study .....	4
1.7 definitions of key terms.....	5
CHAPTER TWO .....	6
LITERATURE REVIEW .....	6
2.0 Introduction .....	6
2.1 Concepts of toxoplasmosis.....	6
2.2 Transmission .....	8
2.3Pathogenicity for toxoplasmosis .....	9
2.4Clinical manifestation .....	9
2.5Laboratory .....	11
2.6 Treatment toxoplasmosis .....	12
2.7 Prevention.....	14
2.8 Burden .....	14

2.9 Prevalence of toxoplasmosis among women .....	15
2.10 Related studies.....	15
CHAPTER THREE .....	17
RESEARCH METHODOLOGY .....	17
3.0 Overview .....	17
3.1 Study design .....	17
3.2 Study area.....	17
3.3 Target population .....	17
3.4 Sample size.....	18
3.5 Sampling procedure.....	18
3.6 Research instrument .....	18
3.7 Validity of the instrument .....	18
3.8 Reliability of the instrument.....	18
3.9 Data gathering procedures.....	19
3.10 Data analysis .....	19
3.11 Ethical considerations .....	19
3.12 Limitations of the study.....	19
CHAPTER FOUR.....	20
Data analysis and interpretation.....	20
4.0: INTRODUCTION.....	20
4.1 Age distribution of the respondents .....	20
Table 4.2 : Respondent by age: .....	20
Figure 4.2 : Respondent by age:.....	21
4.3 Maratial staus of the respodents .....	21
Table 4.3 Marital status.....	21
Figure 4.3 Marital status.....	22
Table 4.4 Educational Level.....	22
Figure 4.4 Educational Level .....	23
Table 4.5 Occupation .....	23
Figure 4.5 Occupation .....	24

Table 4.6 Domestic animal in the house .....	24
Figure 4.6 Domestic animal in the house .....	25
Table 4.7 Type of Domestic animal .....	25
Figure 4.7 Type of Domestic animals .....	26
.....	26
Table 4.8 duration of pregnancy?.....	26
Figure 4.8 duration of pregnancy? .....	27
Table 4.9 have been screened of toxoplasmosis?.....	27
Figure 4.9 have been screened of toxoplasmosis? .....	28
Table 4.10 if yes, what was the result of screening?.....	28
Figure 4.10 if yes, what was the result of screening? .....	29
CHAPTER FIVE .....	30
FINDING, CONCLUSIONS AND RECOMMENDATION .....	30
5. 0 INTRODUCTION.....	30
5.1 Finding .....	30
5.2 Discussion .....	31
5.3 Conclusions .....	32
5.4 Recommendations .....	32
APPENDIX I: REFERENCES .....	34
APPENDIX II .....	36
BUDGET .....	36
APPENDIX III.....	37
TIME FRAME WORK.....	37

## **ABBREVIATIONS**

AIDS	Acquired Immunodeficiency Virus
ART	Anti-Retroviral Therapy
CD4	Cluster Differentiation
CI	Confidence Interval
CNS	Central Nervous System
CSO	Central Statistical Office
CT	Cerebral toxoplasmosis
DAT	Direct Agglutination test
DNA	Deoxyribonucleic Acid
DRGS	Directorate of Research and Graduate Studies
DT	Dye Test
ELISA	Enzyme Linked Immunosorbent Assay
Fig	Figure
HIV	Human Immunodeficiency Virus
IFA	Indirect flurescent antibody
IGA	Immunoglobulin A

## **Abstract**

**Background:** Toxoplasmosis is among the most famous parasitic zoonosis in the globe; it is due to apicomplexan protozoan *Toxoplasma gondii*. The parasites found in the lungs, brain, at most of the times in the lymph nodes and the heart. The sickness influences about 33% of the worldwide populace it is an opportunistic parasitic disease that effect people whose immune system is deficiency, (Suzuki, L.M., Rocha, R.J. and Rossi, 2017).

**General Objective of the study:** The main objective of this research is to determine prevalence of toxoplasmosis among suspected females in Egyptian hospital in Mogadishu Somalia

**Methodology:** The study use qualitative and Cross sectional study because. The study was conducted in prevalence of toxoplasmosis among suspected females in Egyptian hospital in Mogadishu Somalia Mogadishu in Somalia. The target population of this study was be all female patient attended to Egyptian hospital suspected having Toxoplasmosis.

**Results:** This study took into consideration of 30 The study had presented the findings collected from the respondents.

It was found that majority of the respondents according to the age in this study most of them indicate that indicate that 43% % of respondents were 51-60 years, 23% were between 21-30 years, while 13.3% of respondents were 31-40 years, while 10% were between the ages of 41-50.

**Recommendations:** Based on the findings in this study, the followings were recommended.

To avoid contact with material potentially contaminated with cat feces and to avoid ingestion of raw or badly-cooked meat or sub-products

## CHAPTER ONE

### INTRODUCTION

#### 1.0 Introduction

This chapter introduction of the study was contain background, problem statements, research objectives, research questions, Justification of the study, scope of the study, significance of the study and definitions of key terms .

#### 1.1 Background

Toxoplasmosis is among the most famous parasitic zoonosis in the globe; it is due to apicomplexan protozoan *Toxoplasma gondii*. The definitive hosts for the parasite are cats; the warm-blooded creature is its intermediate host. The parasites found in the lungs, brain, at most of the times in the lymph nodes and the heart. The sickness influences about 33% of the worldwide populace it is an opportunistic parasitic disease that affects people whose immune system is deficient. It found that child bearing age ladies and women who is pregnant have a high rate of infection with the world wide and variety relies upon social and cultural mores, geographic components, and mode of transmission. The pervasiveness of the disease is more in warm and humid areas, which is caused by an obligate intracellular protozoan parasite. Individuals can be infected after ingestion of raw or undercooked meat, by ingestion of oocysts shed from cat in the tainted soil, (Suzuki, L.M., Rocha, R.J. and Rossi, 2017)

Toxoplasmosis is a disease affecting 500 million people worldwide. The seroprevalence varies from 5% to 90% depending on geographical location, age, habit of eating raw meat or unwashed fruit and vegetables, and general level of hygiene. The incidence of infections is higher in warmer and humid climate and increases with age. The disease can be congenital or acquired. The parasite after invading the human body multiplies inside the cell, causing damage to the reticuloendothelial system. Rapid multiplication of the parasite and formation of the so-called pseudocysts are characteristics of the acute phase of invasion. In parasitic invasions, an increase is observed in the production of antibodies,

especially in helminthes infections. This defect results from disturbances in the regulation of antibody production by the cells, which promotes local inflammatory reaction. After ingested, the parasite changes to a quick replicating structure referred to as the tachyzoite which invades host cells and produce three successive waves of proteins are secreted from parasite organelles .These proteins can alter host cell function and inhibit the immune response directed towards the parasite by forming a parasitophorous vacuole [PV]. Which preventing lysosomal fusion and killing of the parasite. In immunocompetant individual the infection cleared from the host by the immune system. The parasite at that point changes to a stage that replicates slowly referred to as the bradyzoite that persists in the neural and muscle tissues of the host for the entire life<sup>16</sup>. In parasitic attacks, the cytotoxic action of white blood cells is increased due to the effect of cytokines.

In Somalia, The acquisition of *Toxoplasma* antibodies in various age groups was studied in 2 populations in Somalia, inhabitants of a village in the southern part of the country and residents in Mogadishu. The overall prevalence of antibodies was 56% in the village and 40% in Mogadishu. In both populations, antibodies were acquired early in life. At the age of 10 years, 44% of the villagers and 31% of the Mogadishu children were seropositive. In Europe and the USA, the highest rate of antibody acquisition has been recorded in young adults. This difference may indicate different routes of transmission. In Europe and the USA *Toxoplasma* is transmitted mainly by the ingestion of undercooked pork or lamb Undercooked meat is seldom consumed in Somalia, and pork not at all. However, the soil in Somalia is heavily contaminated with cat faeces and the humid climate in the southern part of the country may contribute to long survival of oocysts. In the villages all household activities are performed on the ground and in Mogadishu children play mainly outdoors on the ground. It therefore seems that conditions in Somalia transmission by oocysts rather than by infected meat. The early acquisition of antibodies in Somalia suggests that infection during pregnancy and, therefore, congenital toxoplasmosis is rare. Female university students are close to childbearing age and their status of *T. gondii* infection. This current research aimed to give data about the

Toxoplasma infection of female university student who is studying at Somali International University.

### **1.2 Problem statement**

Toxoplasmosis is among the most famous parasitic hooknoses in the globe; its due ton apicomplexan protozoan *Toxoplasma gondii*1, the definitive hosts for the parasite are cats; the parasites found in the lungs, brain, at most of the times in the lymph nodes and the as the researcher exhibited for pregnancy women abortion influences more than 33% of the worldwide populace and very high of Somalia for the last thirty years it is an opportunistic parasitic disease that effect people whose immune system is deficiency a high rate of infection with the disease the disease is wide and variety relies upon social and cultural mores, geographic components, and mode of transmission the pervasiveness of the disease is more in warm and humid areas, Toxoplasmosis infection was more common among those with history of close contact with cats, raw meat and vegetable consumption, and low education level. The most important benefit in the serology of toxoplasma is to detect whether the pregnant woman has acute infection or not, and if so, whether it occurred before pregnancy The main problem in diagnosis among pregnant women is long-term antibody does not necessarily indicate acute infection In many cases, laboratory diagnosis of latent and acute is based on detecting, There are several serologic tests for anti- among which has maximum sensitivity and specificity Chronic infection before pregnancy cannot be transmitted to the fetus, but acute untreated infection during pregnancy may lead to congenital toxoplasmosis with neonatal complications The risk of transmission and the severity of fetal disease is based on gestational age and progressive antibody titration so this risk varies between 0–9% (congenital infection during the first trimester) and 35–59% (congenital infection during the third trimester( Welid,2011)

Thus, the researcher was investigate prevalence of toxoplasmosis among female in Egyptian hospital Mogadishu, Somalia

### **1.3 Objectives of the study**

#### **1.3.1 General Objectives**

The aim of this study is to estimate the prevalence of toxoplasmosis among suspected females in Egyptian hospital in Mogadishu Somalia

#### **1.3.2 Specific Objectives**

- ✓ To quantify prevalence of toxoplasmosis among suspected female patients in Egyptian hospital in Mogadishu Somalia.
- ✓ To analyze the demographic of suspected female participating in Egyptian hospital in Mogadishu Somalia

#### **1.4 Research question**

- ✓ . What is the prevalence of toxoplasmosis among suspected female patients Egyptian hospital in Mogadishu Somalia?
- ✓ How is the demographic of suspected female in Egyptian hospital Mogadishu Somalia?

#### **1.5 Scope of study**

1.5.1 **Content scope:** The scope of the study is the prevalence of toxoplasmosis among suspected female Egyptian hospital in Mogadishu Somalia

1.5.2 **Geographical scope:** the Geographical content scope was Egyptian hospital in Mogadishu Somalia.

1.5.3 **Time scope:** this study was conduct in the months of May-June 2019.

#### **1.6 Significance of the study**

The importance of the study is to know the for prevalence of toxoplasmosis among female medical students in Mogadishu Somalia that is more significant for and this study for respondents and educated people to get advantage from it. the study was help both future researchers and current libraries for getting a carefully and evidence based collected data that can be used as a reference to charge something anticipated in the

future. The study was also be useful for readers who are wasing to know more about the performance

### **1.7 definitions of key terms**

**Parasite** are microscopic, one-celled organisms that can be free-living or parasitic in nature they are able to multiply in humans, which contributes to their survival and also permits serious infections to develop from just a single organism.

**Toxoplasmosis** is a zoonotic infection caused by the parasite *Toxoplasma gondii* with a wide range of clinical syndromes in humans for women, infection with *Toxoplasma* during or just before pregnancy can be particularly serious resulting in miscarriage, stillbirth or child disability.

**Apicomplexa** are a large phylum of parasitic alveolates most of them possess a unique form of organelle that comprises a type of plastid called an apicoplast, and an apical complex structure the organelle is an adaptation that the apicomplexan applies in penetration of a host cell.

**Prevalence** refers to a sum of instances of a particular disease within the given population at a certain point in time. It can be written as a proportion of the form: total instances of disease in the population / total number of individuals in the population.

**Clinical manifestation** that can be either objective when observed by a physician, or subjective when perceived by the patient. Synonym Symptoms and Signs narrow term body Temperature Changes.

**Transmission** are infectious diseases can be spread through direct contact are Person to person a common way for infectious diseases to spread is through the direct transfer of bacteria, viruses or other germs from one person to another

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.0 Introduction

*Toxoplasma gondii* is a ubiquitous protozoan parasite that is estimated to infect one-third of the world's human population. It can infect many species of warm-blooded animals and is a significant zoonotic and veterinary pathogen it is recognized as a category B priority pathogen by the National Institutes of Health, Bethesda, USA. In several of its hosts, *T. gondii* is associated with congenital infection and abortion.

#### 2.1 Concepts of toxoplasmosis

*T. gondii* can cause encephalitis or systemic infections in the immunocompromised, particularly individuals with HIV/AIDS. It has been 100 years since *T. gondii* was initially described in the tissues of *Ctenodactylus gundi*, a North African rodent,

Symptoms, toxoplasma gondii are not aware of it because they have no symptoms at all. Some people who have toxoplasmosis may feel as if they have the “flu” with swollen lymph glands or muscle aches and pains that may last for a month or more.

Organ is a single-celled parasitic organism that can infect most animals and birds. Because *T. gondii* infectious organisms are excreted only in cat feces, wild and domestic cats are the parasite's ultimate host.

In the same year Splendore (1908), in Brazil, reported on the identification of this organism in the tissues of a rabbit. The genus was named by Nicolle and Manceaux as *Toxoplasma* for its bow-like shape (from Greek: toxobow or arc; plasma=creature). Other forms of *Toxoplasma* including tissue cysts were recognized to exist by several researchers including Frenkel and Friedlander (1951), but it was not until the 1960s and 1970s that the parasite was identified as a coccidian. The cat was identified as the definitive host by several groups working independently, including Frenkel et al. (1970).

Further details of the history of the discovery of the pathogen are described in recent reviews (Ajioka and Soldati, 2007; Dubey, 2007).

In humans, *T. gondii* is commonly acquired by the oral ingestion of tissue cysts containing bradyzoites; however it can also be acquired by the ingestion of oocysts containing sporozoites that are the product of a sexual cycle in cat intestines. Classically, consumption of undercooked meat, particularly pork and lamb, has been ascribed to be the major risk factor for acquisition of toxoplasmosis. Improved animal husbandry practices as well as increased awareness of the risks of consuming undercooked meat have resulted in decreased prevalence of toxoplasmosis world-wide (Tenter et al., 2000).

The recognition of waterborne toxoplasmosis in humans has provided another dimension to the epidemiology of this infection after ingestion, tissue cysts or oocysts invade host cells and differentiate into tachyzoites which divide rapidly within host cells and together with the host's immune response to this pathogen are responsible for the clinical manifestations of infection. Tachyzoites differentiate into latent bradyzoite forms which are surrounded by a carbohydrate-rich cyst wall within the parasitophorous vacuole this differentiation can be increased by exposure of the organism to stress conditions such as an immune response to the tachyzoites. Tissue cysts can persist indefinitely for the life of the host, perhaps due to a cycle of reaction and re-infection. If an individual becomes immunocompromised these tissue cysts serve as a reservoir from which disseminated or local infections can develop. Tissue cysts have a predilection for neural and muscle tissue as well as the eye in humans, with most cases of reactivation disease presenting as encephalitis or chorioretinitis. (Frenkel et al. (1970)

While asymptomatic infection with *T. gondii* resulting in a latent infection with tissue cysts is common in humans, symptomatic infection, i.e. toxoplasmosis, is seen much less frequently. Specific groups of patients including congenitally infected fetuses and newborns, and immunologically impaired individuals are, however, at high risk for severe infection due to this parasite.

## **2.2 Transmission**

Acquired toxoplasmosis, Humans are most commonly infected by ingestion of contaminated food or water containing oocysts or from tissue cysts (bradyzoites) in undercooked or raw meat. In the beginning of the nineties, a prospective case-control study examining risk factors for being infected with toxoplasma in pregnancy was conducted. The strongest risk factors were eating raw mutton supported in the literature. In addition, cleaning the cat litter box and poor kitchen hygiene were associated with maternal toxoplasma infection. Travel to countries outside of Scandinavia was not an independent risk factor when controlling for the other risk factors. In the review by Petersen et al. published in 2009, they described a substantial proportion of infected women without any known risk behavior. Furthermore, the parasite may be transmitted through blood transfusion, by organ transplantation or direct inoculation of parasites by laboratory. After primary infection, immunity develops, as demonstrated by toxoplasma IgG antibodies. Thereafter, the person has a lifelong latent infection. Infection acquired before pregnancy does not affect the foetus because the foetus is protected by the maternal. Congenital transmission of the parasite was the first mode of transmission to be recognized. Isolation of parasites from placenta and infected neonates suggested that the parasite was transferred from the maternal bloodstream via the placenta to the foetus. Several factors might influence the degree of the foetal infection; parasite strain, virulence, parasite inoculum number, gestational age (GA) at infection and immune competence of the mother and the foetus. Evidence indicates that foetal infection occurs in the early phase of maternal infection, during her parasitemia, i.e. most commonly during the first weeks of acute infection before the development of maternal antibodies and before the appearance of clinical signs and symptoms. Replication of the parasites in the placenta may cause a delay between maternal and foetal infection earlier the foetus is infected, the more serious is the outcome. Women with the highest risk of delivering a child with congenital infection appear to be those infected between the 10th and 24th gestational weeks (GW), in particular, before GW. The overall transmission rate in pregnancy is 23-30%, but is lower in first trimester (B, JONH, 2011)

### **2.3 Pathogenicity for toxoplasmosis**

Toxoplasmosis can take an acute or chronic. Acute infection is associated with proliferative forms (tachyzoite), whereas chronic infections associated with tissue cyst forms. During the acute process, tachyzoite invades all cells in the body except host nucleated cells such as red blood cells. Tachyzoite enters the host cell via active penetration into the host plasma lemma or by phagocytosis. Parasites adhere to micronema are able to recognize and target cells, produce enzymes to mature rhoptries parasitophorus vacuoles. in each cell, the parasite was be out to infect neighboring cells. With the host immune system, can turn into a subpopulation tachyzoite bradyzoite Macrophages, NK cells, fibroblasts, epithelial cells and endothelial cells become activated by T.gondii infection in the host body, so it can be inhibited parasite proliferation. Non-specific immune response depends on the ability that destroys tryptophan which is a substance necessary for the growth of the parasite. These parasites was induce immunity 4 types of T cells, namely cell-mediated immune response as T.gondii are intracellular parasites.by macrophages also strengthen the work of CD4 + cells producing IFN -  $\gamma$  in. CD8 + cells also induces the release of IFN -  $\gamma$ , interferon  $\gamma$  (IFN -  $\gamma$ ) plays a role in cyst formation by inhibiting replication in macrophages tachyzoite mice and induce antigen specific for bradyzoite. The humoral immune system has a small role in the fight against toxoplasmosis but is of significant importance in the diagnosis of toxoplasmosis in humans. Antibodies produced by the humoral immune system is able to kill extracellular T.gondii in and through the activities of its complement can inhibit parasite multiplication. Ganesh et al. 2004).

### **2.4 Clinical manifestation**

Acquired toxoplasma infection is usually asymptomatic in immunocompetent humans. However, toxoplasmosis may present as nonspecific flulike symptoms, fatigue or gastroenteritis and with signs like lymphadenopathy or rash Cervical lymph nodes are the nodes most commonly involved, and the liver and spleen may be affected Chorioretinitis and opticus neuritis are reported in immunocompetent individuals, in particular, in South America where the more pathogenic toxoplasma type I and nonarchetypal strains are

dominating in immune-compromised individuals, the parasite may cause a fatal disease, most commonly encephalitis. Transmission to the foetus causes a wide spectrum of clinical features, ranging from asymptomatic or mild visual disturbances to spontaneous abortion, foetal death and severe brain damage. Foetal infection during the first trimester was often result in miscarriage or severe malformations commonly resulting in termination of the pregnancy. The classic tetrad of symptoms and findings of the neonate when infected as foetus early in pregnancy are chorioretinitis, hydrocephaly. (Montoya & Remington 1996).

Clinical manifestation for toxoplasmosis is a parasitic disease with worldwide distribution caused by *Toxoplasma gondii*. Retinochoroiditis is often seen in settings of congenital or postnatally acquired disease as a result of acute infection or recurrence (Nussenblatt & Belfort 1994,)

This disease typically affects the posterior pole of a single eye and the lesions can be solitary, multiple or satellite to a pigmented area. A compulsory intracellular protozoal parasite that infects most species of warm-blooded animals, including humans. Inside human body it virtually infects all nucleated cells. Toxoplasmosis causes potentially life-threatening, opportunistic infection in the setting of immunosuppression, harboring a challenging clinical problem of major public health concern. In contrast, in immunocompetent hosts, acute infection is typically asymptomatic and subclinical or causes mild, self-limited symptoms and signs. Toxoplasmosis is categorized into four major groups: congenital toxoplasmosis (CnT), acquired toxoplasmosis in immunocompetent hosts, ocular toxoplasmosis (OT), congenital or acquired and cerebral toxoplasmosis. The periphery towards the centre, with variable pigmentary changes. Anterior uveitis is another common finding, with mutton-fat keratic precipitates, cells and flare, and posterior synechiae (Nussenblatt & Belfort 1994).

The retina is the primary site of *T. gondii* infection in the eye, but the choroid, vitreous and anterior chamber are also involved. The choroid is secondarily affected, although choroidal lesions do not occur in the absence of retinal infection. An intense secondary

iridocyclitis may also be present. In addition, the optic nerve head can also be involved in ocular toxoplasmosis. Elderly or immunosuppressed patients may present with more aggressive bilateral or multifocal disease. Elderly patients recently infected with *T. gondii* may have a higher prevalence of ocular involvement. Other atypical presentations include punctate outer retinal toxoplasmosis, retinal vasculitis, retinal vascular occlusions, hemorrhagenous with serous retinal detachments, unilateral pigmentary retinopathy mimicking retinitis pigmentosa, neuroretinitis and additional forms of optic neuropathy, peripheral retinal necrosis in active old ocular toxoplasmosis lesions with vitreous strand and vasculitis in ocular toxoplasmosis with old pigmented scar and recurrence inferior to the macula, cataract, glaucoma, optic nerve atrophy and retinal detachment (Bosch-Driessen et al. 2000).

An association between ocular toxoplasmosis and Fuchs' heterochromic cyclitis has been described (Toledo de Abreu et al. 1982) and confirmed by several researchers (Schwab 1991, La Hey & Baarsma 1993). The appearance of toxoplasmic retinochoroiditis lesions varies. The duration and intensity may be related to the host, parasite, or environmental factors (Holland et al. 1996). The genotype of the infecting parasite appears to be an important determinant of disease severity in immunocompetent patients (Holland 2004).

## **2.5 Laboratory**

Acute infection with *Toxoplasma gondii* is diagnosed by detection of the parasite directly in patients' specimens using histological or immunological methods, isolation of *T. gondii* from blood, body fluids or tissue by inoculation in laboratory mice or on tissue culture cells, or (iii) serological methods for determination of a significant, *T. gondii*-specific, antibody titre rise or of *T. gondii* specific IgM (or IgA) antibody. Because of their high sensitivity, specificity and relative ease of performance, serological methods are preferentially used for diagnosis of *T. gondii* infection. The diagnosis of acute, postnatally-acquired, primary toxoplasmosis is usually established by serological methods and was in general present few problems. However, diagnosis of congenital infections and their late sequelae or of reactivation of a latent infection in immunocompromised patients is often more troublesome because of the absence of a

significant antibody titre rise or the lack of specific IgM antibody. In these cases a combination of various methods may be required for definitive diagnosis of *T. gondii* infection.

## **2.6 Treatment toxoplasmosis**

An acquired infection in immunocompetent humans usually has a benign character and specific treatment is rarely indicated; nevertheless, one exception is a primary infection in pregnancy. Pyrimethamine, sulphonamide and spiramycin are the most common drugs used for treating acquired or congenital infection with *T. gondii*. Primarily these drugs slow down the multiplication of tachyzoites, the antimalarial drug pyrimethamine in combination with sulphonamides have been the drugs of choice when antenatal or neonatal infection is verified. However, these drugs do not eliminate tissue cysts, unlike azithromycin and atovaquone, which have been shown to break down the cysts. Pyrimethamine penetrates the blood-brain and the retina barriers and concentrates in the brain and retinal tissue. The drug acts as a folic acid antagonist and the main adverse effect is, therefore, thrombocytopenia and leukopenia. Folic acid is, therefore, given as a supplement to the treatment and the hematologic profile is regularly controlled. Pyrimethamine and sulphadiazine may be used in second and third trimester in order to prevent mother-to-child transmission; however, spiramycin, azithromycin or other macrolides are more commonly used in this situation (Moln,211)

Most human infections with this protozoon are asymptomatic, although a minority may present malaise, low grade fever and lymphadenopathy the immune compromised patient can face a severe, life-threatening infection. Mother-to-child transmission of the parasite occurs only when infection is acquired for the first time during pregnancy. Infection may be transmitted to the fetus or during vaginal delivery. Congenital toxoplasmosis may present as a mild or severe neonatal disease. There is a wide variety of manifestations of congenital infection, ranging from fetal death to small size for gestational age, prematurity, peripheral retinal scars, persistent jaundice, mild thrombocytopenia, and the characteristic triad of hydrocephalus, and cerebral calcifications. Retinal disease, which may be unilateral, follows a relapsing and remitting course into adult life, often with

severe impairment of vision with the advent of prenatal diagnosis, attempts are being made to treat the infection during the gestational period. The aim of this approach is to decrease the risk of mother-to-child transmission of the infection and possibly anticipate its treatment before birth. The key drugs which are administered are antibiotic, with an antibacterial spectrum comparable to that of erythromycin and Sulfadiazine – a sulfonamide antibiotic. Once it has been established that the mother's serological test results are consistent with a recently acquired infection and that acquisition of the infection during the first 18 weeks of gestation or shortly before conception cannot be excluded, a treatment with spiramycin should be administered in order to prevent vertical transmission of the parasite. If fetal infection is confirmed by a positive result of PCR on amniotic fluid at 18 weeks of gestation or later, treatment with pyrimethamine, sulfadiazine, and folic acid is recommended after the eighteenth week of gestation, it's necessary to administer the combination -sulfadiazine immediately, because the rate of mother-to-child transmission is so high as to render Obviously it's important to take account of possible side effects of which is important in the synthesis of folic acid, thus producing reversible and usually gradual bone marrow depression. In fact, during this period of drugs administration, the mother is carefully monitored for development of hematologic toxicity. If significant toxicity appears, despite treatment with folic acid, the drug combination is discontinued until the hematologic abnormalities are corrected and the drug regimen is then restarted. Although this treatment is in use for a long time and many studies have been conducted over the years, our knowledge on its efficacy is not entirely clear. Concerning spiramycin, the results of observational studies showed the potential of this antibiotic to prevent vertical transmission of the disease. Moreover, it may reduce the severity of infection in a fetus because it delays transmission to a later time in gestation, when transmission is associated with less severe manifestations of infection. Instead, the combination of pyrimethamine and sulfadiazine is highly active against and is widely used as a treatment to reduce the risk of clinical manifestation. Currently the debate about the effectiveness of this treatment is becoming more heated. Many studies have set themselves the goal of finding strong.( Weldit,2011).

## **2.7 Prevention**

Prevention of toxoplasmosis can be made by cooking the meat until done, wash your hands thoroughly after handling raw meat, wash vegetables and fruits before eating, wash and clean kitchen equipment after use, pregnant women should wear gloves when gardening and wash hands afterwards, avoid contact with cat feces, the primary and secondary prophylaxis should be administered to patients with risk of acquiring *T. gondii* can be reduced by proper food preparation. Meats should be cooked to an internal temperature sufficient to kill this organism. Consumers should be aware that it could be present in shellfish and fish, as well as in other meats, and in untreated water sources, such as lakes and streams. Freezing, salting, pickling and smoking do not reliably destroy *T. gondii*, although some techniques (e.g., freezing) destroy a high percentage of cysts. Fruits and vegetables should be peeled or washed well to remove oocysts. Good hygiene, including the use of hot, soapy water on items that touched potentially contaminated food (e.g., meats, raw vegetables), is important. Hands should be washed after contact with raw meat, soil or sand, and before eating or touching the face. Pregnant women and others at risk should wear gloves during soil or sand contact. Care should be taken when handling the live vaccine for sheep. Highly susceptible individuals should be aware that seronegative cats are likely to shed *T. gondii* on first exposure. Regardless of an animal's antibody status, litter boxes should be cleaned daily to reduce the risk of oocyst sporulation, and rinsed with boiling water. Pregnant women and immunosuppressed individuals should avoid cleaning the litter box; if this is unavoidable, they should use gloves, then wash their hands. Sporulated oocysts are unlikely to be found on fur, and direct contact with cats is not expected to be a risk. Prophylaxis and/or screening for toxoplasmosis may be employed in immunosuppressed patients. Recommendations on prenatal and/or neonatal screening differ between countries. Early treatment of con.(Molid,2011).

## **2.8 Burden**

Toxoplasmosis is present in every country and seropositivity rates range from less than 10% to over 90%. The causative agent, *Toxoplasma gondii*, has a complex life cycle and is

an important foodborne pathogen. Human infection can result from the ingestion or handling of undercooked or raw meat containing tissue cysts. Alternatively, it can result from direct contact with cats or from the consumption of water or food contaminated by oocysts excreted in the faeces of infected cats.

Prevalence of Infection in Humans is generally assumed that approximately 25 to 30% of the world's human population is infected by *Toxoplasma*. Actually, the prevalences vary widely between countries (from 10 to 80%) and often within a given country or between different communities in the same region. Low seroprevalences (10 to 30%) have been observed in North America, in South East Asia, in Northern Europe, and in Sahelian countries of Africa. Moderate prevalences (30 to 50%) have been found in countries of Central and Southern Europe, and high prevalences have been found Latin America and in tropical African countries.

### **2.9 Prevalence of toxoplasmosis among women**

The role of maternal toxoplasmosis as a risk factor for habitual abortion was investigated. The indirect haemagglutination test was positive in a titre of 1:32 to 1:2048 much more frequently in women with habitual abortion [18.5%] than in the normal pregnancy group [5.9%]. The overall prevalence of antibodies gradually increased with age, reaching 23.7% in the age group 35-45 years. No differences were found among women in different socioeconomic groups. The study suggests that toxoplasma antibodies are more prevalent in women with cats at home than in women who do not possess cats.

### **2.10 Related studies**

Toxoplasmosis is an environmental disease as transmission of the infection has been shown to be promoted by poor environmental practices, poor eating habits, cat ownership, poverty, poor hygiene among others (Onadeko, *et al.*, 1992).

Related studies was carried out in different aspects, a study was carried out at Chipokotamayamba clinic with the main objective being to determine the seroprevalence of toxoplasmosis and also to investigate any possible risk factors.

The overall seroprevalence for toxoplasmosis in individuals attending Chipokotamayamba clinic was found to be 10.8%. These results indicate that Chipokotamayamba clinic is a facility with low *T. gondii* seroprevalence in comparison to previously reported estimates of prevalence in some studies done in the region such as 20% in South Africa, 54% in Kenya and 35% in Tanzania (Kristiah, 2009). However, the results are comparable to those reported in Botswana with a seroprevalence of 11% (Kristiah, 2009). A similar study done in Zambia in 1991 found an overall seroprevalence of 7% (Zumla, *et al.*, 1991). This shows a slight increase in prevalence although there may be limitations in drawing inference from this information as the populations from which the two sets of data were drawn from are different as well possible differences in research methods employed.

The comparatively high prevalence in the age group 0 to 13 years of 12.5% is suggestive of infants engaging in risky behavior such as playing in soil environments (Jones, *et al.*, 2001). This behaviour is usually high in childhood years. The age group of 24 to 33 is however unexplained leading us to speculate that cohort effect may affect the distribution of toxoplasmosis across ages, with there being a higher risk in the past as an explanation for the age trends.

## CHAPTER THREE

### RESEARCH METHODOLOGY

#### 3.0 Overview

In this chapter, the researcher discussed the research design. The target population, sampling techniques, sample size, research instruments, data collection procedure, reliability and validity of the instrument, data analysis, ethical considerations and finally the limitation of the role of prevalence of toxoplasmosis among female medical students in Mogadishu Somalia.

#### 3.1 Study design

This study was conducted through explanatory research design a strategy is data collection method that determines whether, and to what extent an association exists between two or more paired and quantifiable variables (Onen and Oso, 2008). Survey research aims to ascertain if there is significant association between two variables (Reid, 1987). The study is also said to be survey in design because there was intent to establish the role of mass media on community development and this method was considered best for the research's purpose. This study was conducted through cores-sectional descriptive study design, quantitative method. Also the study was use both Secondary data.

#### 3.2 Study area

Our study area is Egyptian hospital in Hodan District Mogadishu Somalia.

Egyptian hospital has many departments E.g First aid department, Pediatric department, obbs and gyna department, neurology department, urology department, operation theatre, ENT Department and Dental Department.

#### 3.3 Target population

The target population of this study was female patient attended to Egyptian hospital suspected having Toxoplasmosis. 30 females were tested for Toxoplasmosis and recorded during the last three months.

### **3.4 Sample size**

All female patients tested for toxoplasmosis during the last three months was be included in this study. The sample size of this study was 30 patients.

### **3.5 Sampling procedure**

Consecutive sampling was used to conduct this study.

### **3.6 Research instrument**

Since we are using secondary data, there are no specific tools going to be used to carry out this study.

### **3.7 Validity of the instrument**

Validity refers to the extent to which data collection method accurately measures what it was intended to measure or to the extent to which research findings are about what they are claimed to be about (Saunders, Lewis & Thornhill, 2009).

### **3.8 Reliability of the instrument**

Reliability refers to the consistency in reaching the same result when the measurement is made repeatedly. When it comes to the questionnaire, pre-testing, revision and further testing of it may increase its reliability (Webb, 2002). To increase the reliability of this research, one data collection tool was be use to gain as much reliable and appropriate information as possible. The research team conduct questionnaire, in order to increase the reliability of this study. Before handing out the questionnaire, the researcher did pilot testing with five experts including the supervisor. Some changes as well as reformulations of questions and possible amendments were made as the result of that pilot test.

### **3.9 Data gathering procedures**

Data is already collected by health workers at Egyptian hospital.

### **3.10 Data analysis**

The data of this research was analyzed with the help of the statistical program SPSS 17.

This program was choosing because it is capable of processing various statistical analyses that are not available in Excel. The researcher used correlation statistics to describe the variables in this study. Template analyses were use to analyze questionnaire.

### **3.11 Ethical considerations**

To carry out this study, the researcher coordinates with and was be use individual and institutional data. Thus, the data collect was keep confidential and was exclusively used for the purpose of bachelor's degree requirements. The respondents was be informing of the contents and the aims of the research prior to administration of any instrument. This research was be fully conducted ethically and all copyrights was be observed and where permission was require reproducing materials was be sought. Approval was taken from faculty of health science.

Accessibility of the data may be limited, some of the respondents were not wasing to share with the researcher some of the information that they consider

Transportation was another limitation. Also this study is self-sponsored

### **3.12 Limitations of the study**

The main limitations during of our study was road blockings, Research area insecurity and examination challenges. We also had research finding problems because of limited access to the research areas and gabs of transportation routes.

## CHAPTER FOUR

### Data analysis and interpretation

#### 4.0: INTRODUCTION

This chapter presents the findings and discussions of the study and statistical analysis including descriptive statistics {frequency and percentage} were used and the obtained results mainly focus the Demographic data of the respondents in terms of, gender, age, marital status, education level and occupation, this is followed by subject knowledge, effects of toxoplasmosis on women in Egyptian hospital.

#### 4.1 Age distribution of the respondents

**Table 4.2 : Respondent by age:**

Age	Frequency	Percentage
21-30 years	7	23.4
31-40 years	4	13.3
41-50 years	3	10.0
51-60 years	13	43.3
Above 60	3	10.0
<b>Total</b>	<b>30</b>	<b>100.0</b>

Findings in Table 4.2 indicate that 43.4% % of respondents were 51-60 years, 23.4% were between 21-30 years, while 13.3% of respondents were 31-40 years, while 10% were between the ages of 41-50.

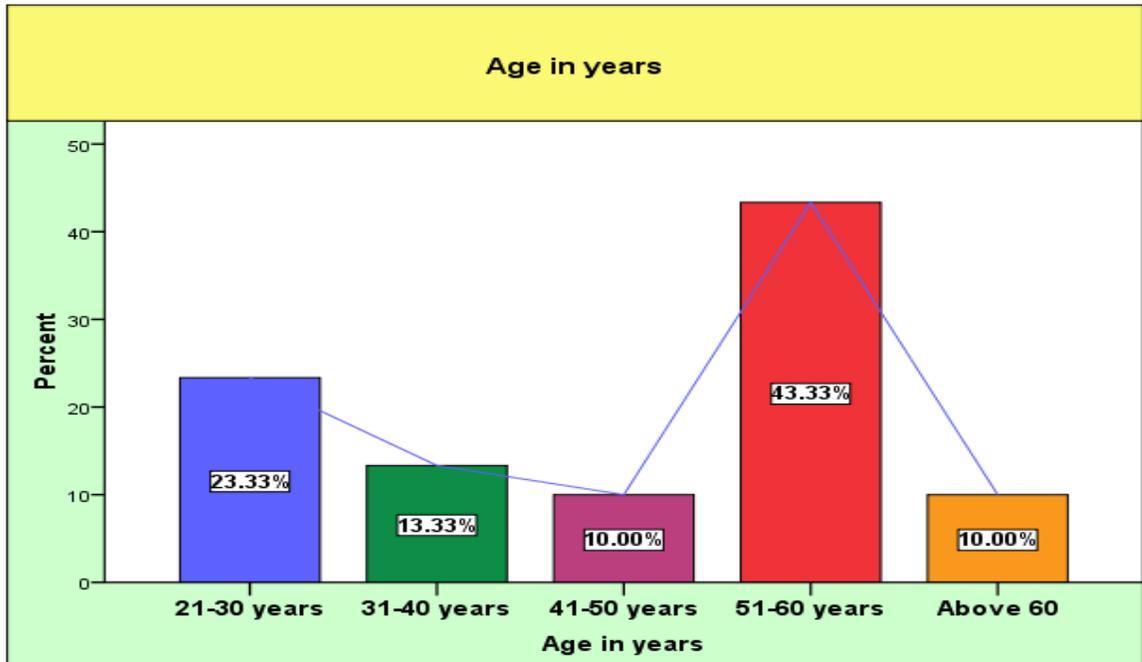


Figure 4.2 : Respondent by age:

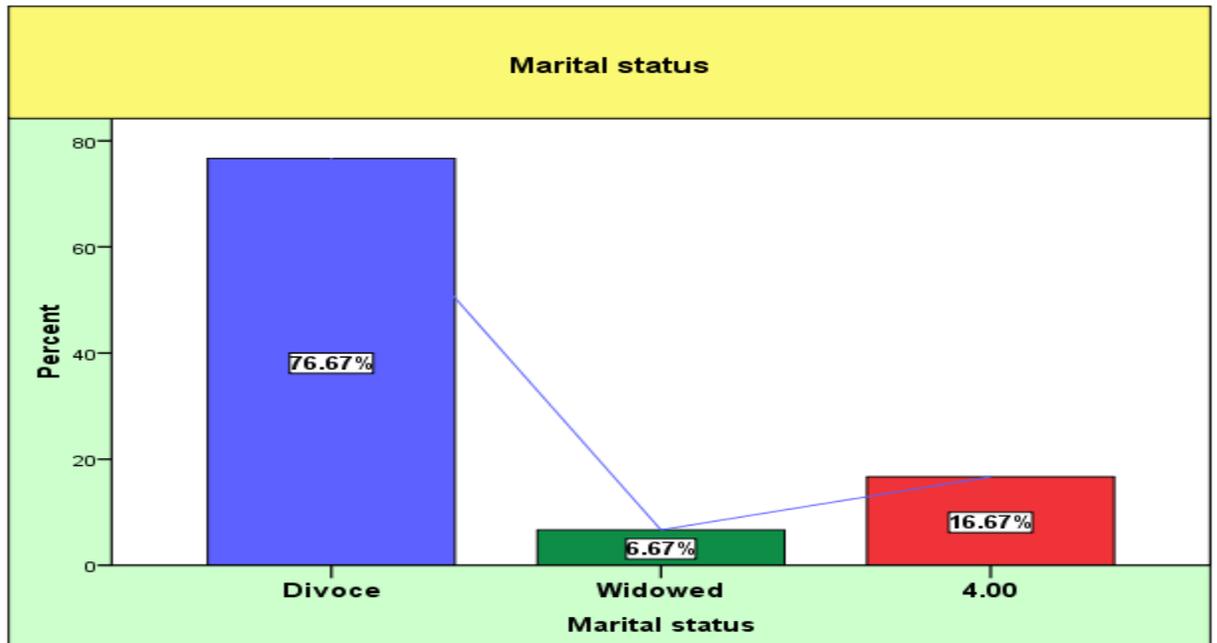
#### 4.3 Marital status of the respondents

Table 4.3 Marital status

Marriagal states	Frequency	Percent
Married	23	76.7
Widowed	2	6.6
Single	5	16.7
<b>Total</b>	<b>30</b>	<b>100%</b>

Figure 4.3 shows that 23 (76.7%) of the respondents were marriage group, 5 (16.7%) were Single group, and 2 (6.6%) were widowed. So that the marriage group of respondents is more than the other two groups.

**Figure 4.3 Marital status**

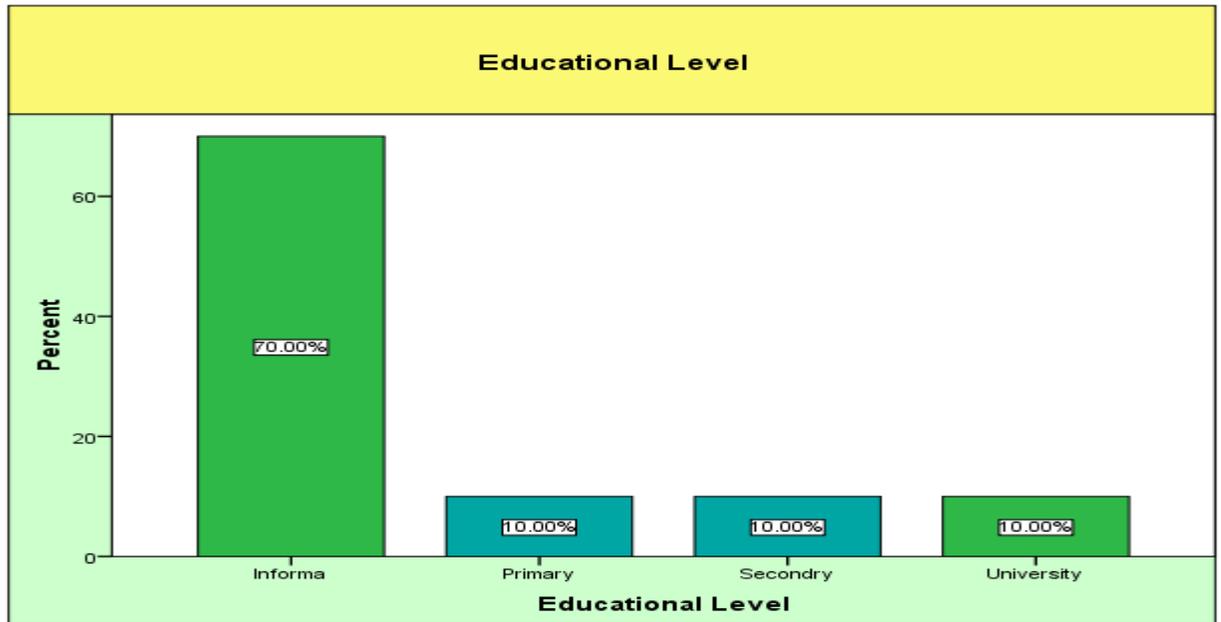


**Table 4.4 Educational Level**

Educational level	Frequency	Percent
Informal	21	70
Primary	3	10
Secondary	3	10
University	3	10
Total	30	100.0

The findings of the study from table 4.4 shows that 21 (70%) of the respondents have Informal education level, 3 (10%) were primary level, 3 (10%) of the respondents were secondary level, while 3 (10%) were mentioned university level. According to the findings this clearly shows that education level is more than the other level of educations in the respondents.

**Figure 4.4 Educational Level**

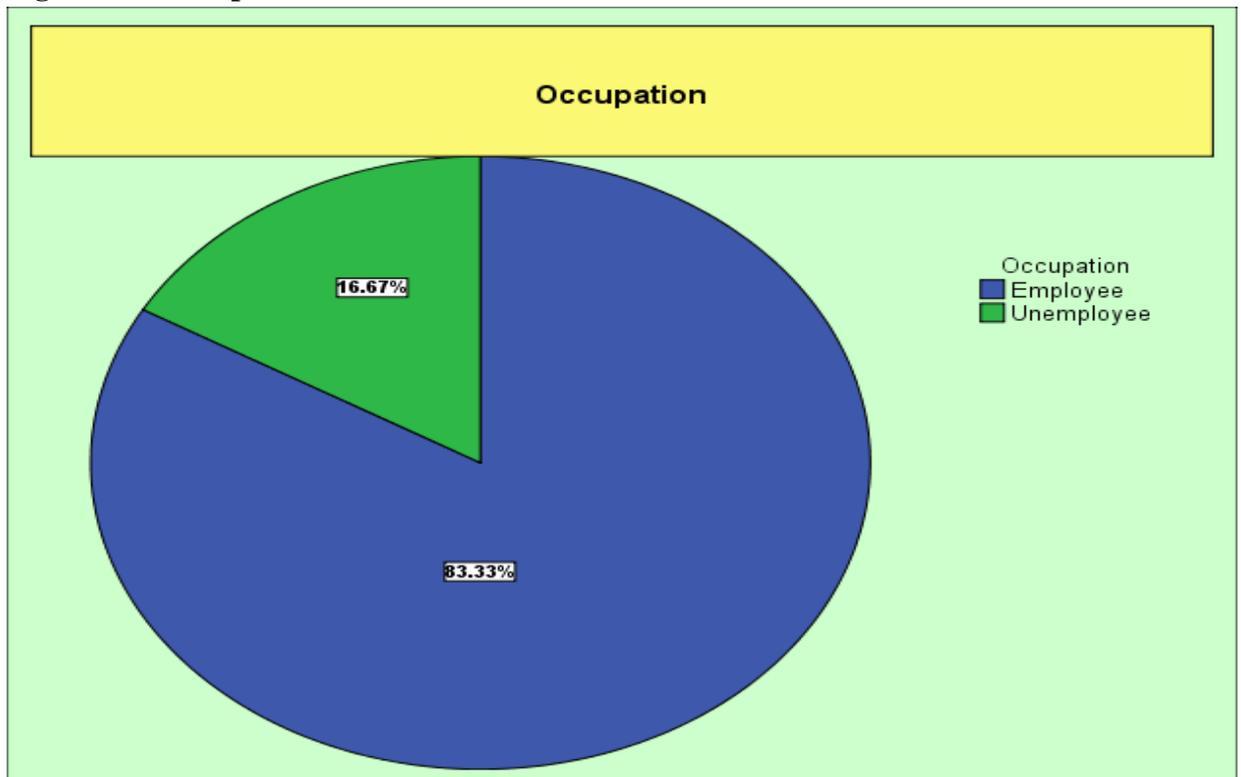


**Table 4.5 Occupation**

Marriage status	Frequency	Percentage
Employee	25	83.3
Unemployed	5	16.7
Total	30	100.0

**Table 4.5** In the above figure 4.4, the respondents of occupation, 25 (83.3%) of respondents were Employee, and while 5 (16.7%) were Un-employee.

**Figure 4.5 Occupation**

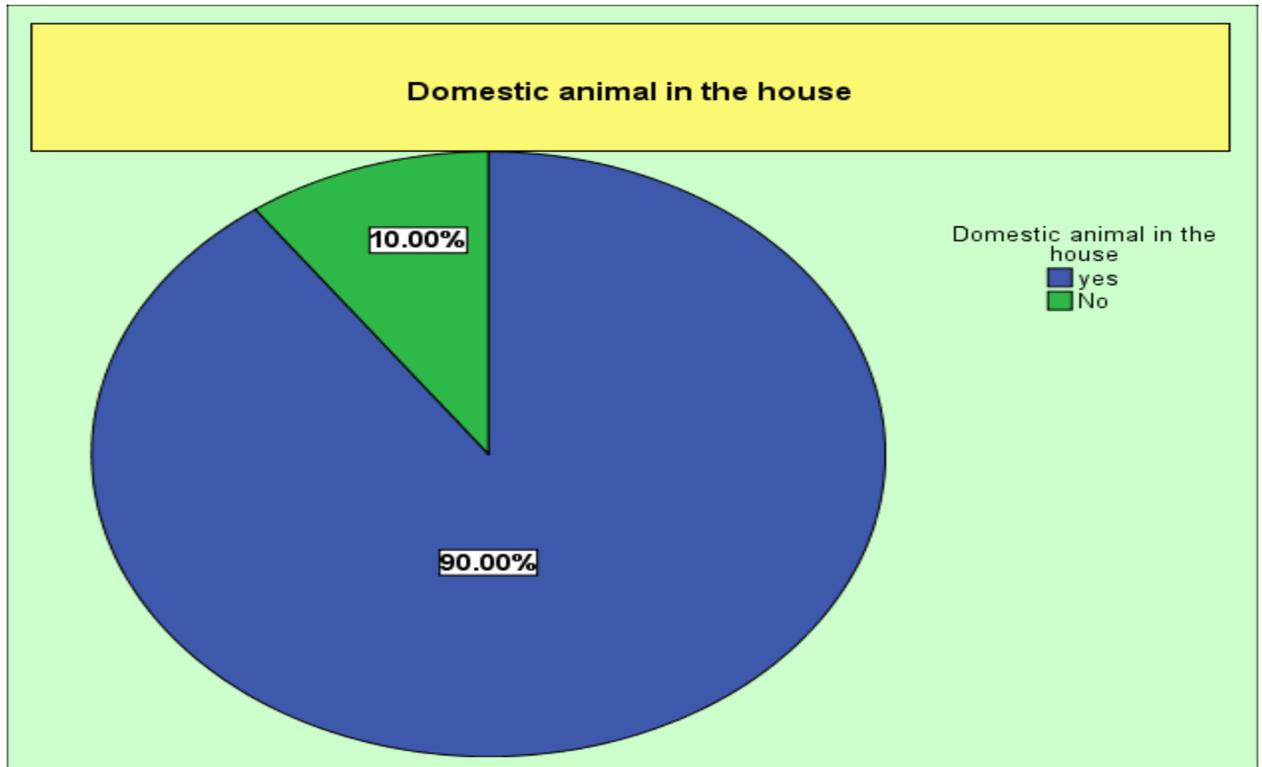


**Table 4.6 Domestic animal in the house**

Is there domestic animal in the house?	Frequency	Percent
Yes	27	90.0
No	3	10.0
Total	30	100.0

In the above figure 4.6 When the respondent asked whether **Domestic animal in the house**, 27 person which equivalent 90 % said yes and 3 person which is equivalent 10% said No.

**Figure 4.6 Domestic animal in the house**

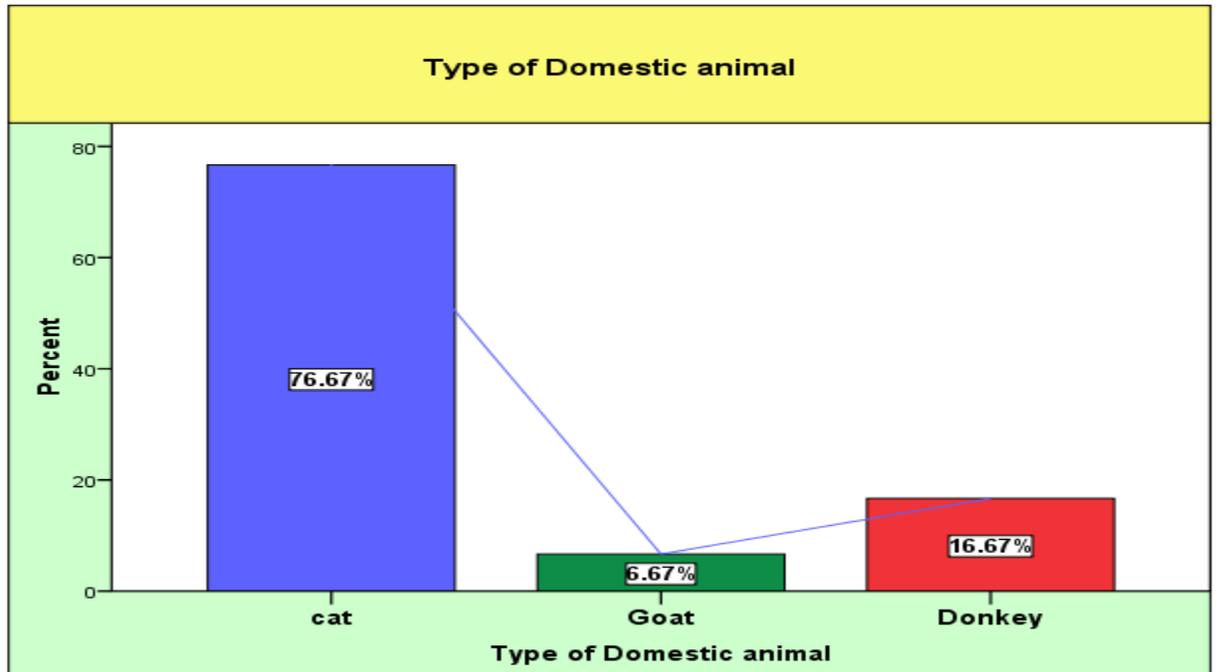


**Table 4.7 Type of Domestic animal**

Material status	Frequency	Percent
Cat	23	76.7
Goat	2	6.6
Donkey	5	16.7
Total	30	100%

In the above figure 4.7 the respondents of **Type of Domestic animal**, 23 (76.7%) of respondents mentioned cat, while 5 (16.7%) mentioned Donkey, and while 2 (6.6%) said Goat.

**Figure 4.7 Type of Domestic animals**



**Table 4.8 duration of pregnancy?**

	Frequency	Percent
First trimester	19	63.3
Second trimester	11	36.7
Total	30	100.0

In the above table 4.8 the respondents of duration of pregnancy, 19 (63.3%) of respondents were First trimester, 11 (36.7%) were Second trimester.

**Figure 4.8 duration of pregnancy?**

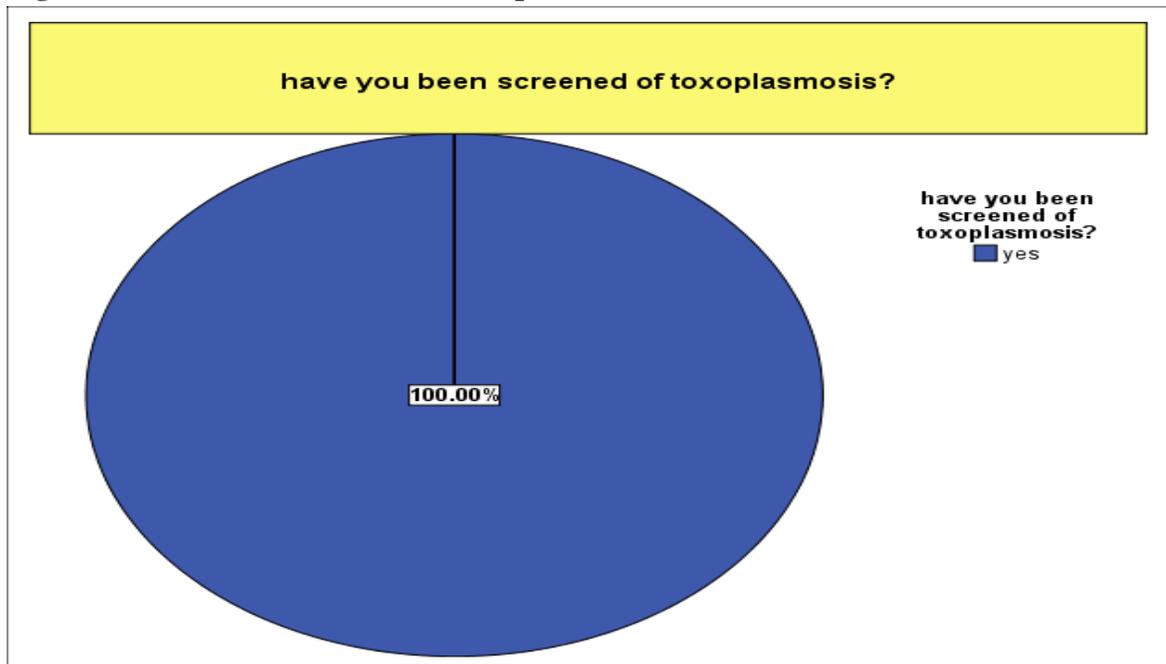


**Table 4.9 have been screened of toxoplasmosis?**

		Frequency	Percent
Valid	Yes	30	100.0

In the above figure 4.9, When the respondent asked whether they have been screened of toxoplasmosis, this showed that 30 women which equivalent 100 % Have been screened of toxoplasmosis.

**Figure 4.9 have been screened of toxoplasmosis?**

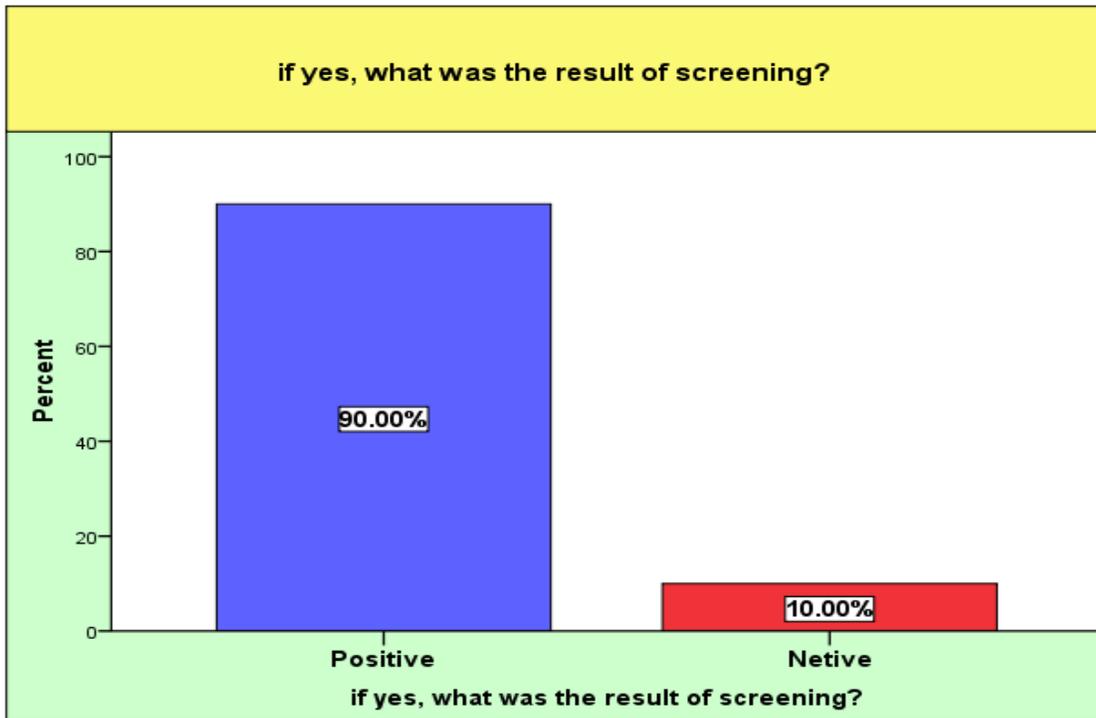


**Table 4.10 if yes, what was the result of screening?**

Material status	Frequency	Percentage
Positive	27	90.0
Negative	3	10.0
Total	30	100.0

In the above figure 4.10, When the respondent asked what was the result of screening?, 27 person which equivalent 90 % were positive, and 3 person which is equivalent 10% were negative.

**Figure 4.10 if yes, what was the result of screening?**



## CHAPTER FIVE

### FINDING, CONCLUSIONS AND RECOMMENDATION

#### 5. 0 INTRODUCTION

This chapter was discussed the findings, conclusion and recommendation of this study. First it was be discussed the major finding of each study stated in the research objectives The conclusion was be draw from of the finding of the study. Finally, research was bring recommendation about further research for this study.

#### 5.1 Finding

The study had presented the findings collected from the respondents. Based on data gathered, the result of the analysis indicated as prevalence of toxoplasmosis among suspected females in Egyptian hospital in Mogadishu Somalia..

The sample size of the study population 30 patient's. The variables of interest researched on were, marital status, age, level of education, occupation and monthly income.

It was found that majority of the respondents according to the age in this study most of them indicate that indicate that 43% % of respondents were 51-60 years, 23% were between 21-30 years, while 13.3% of respondents were 31-40 years, while 10% were between the ages of 41-50.

The study showed that 23 (69.7%) of the respondents were marriage group, 5 (15.5%) were Single group, and 2 (6.1%) were widowed. So that the marriage group of respondents is more than the other two groups..

The study showed that 21 (63.6%) of the respondents have Informal education level, 3 (9.1%) were primary level, 3 (9.1%) of the respondents were secondary level, while 3 (9.1%) were mentioned university level. According to the findings this clearly shows that education level, is more than the other level of educations in the respondents.

Respondents of occupation, most of the respondents 25 (75.8%) of respondents were Employee, and while 5 (15.2%) were Un-employee.

When the respondent asked whether Domestic animal in the house, 27 person which equivalent 90 % said yes and 3 person which is equivalent 10% said No.

Type of Domestic animal, 23 (76.7%) of respondents mentioned cat, while 5 (16.7%) mentioned Donkey, and while 2 (6.7%) said Goat.

According to the duration of pregnancy, majority of the respondents 19 (63.3%) of respondents were First trimester, 11 (36.7%) were Second trimester.

In this study When the respondent asked whether they have been screened of toxoplasmosis, 30 women which equivalent 100 % Have been screened of toxoplasmosis.

When the respondent asked what was the result of screening?, 27 person which equivalent 90 % were positive, and 3 person which is equivalent 10% were negative.

## **5.2 Discussion**

The results of the present study demonstrate prevalence of toxoplasmosis among suspected females in Egyptian hospital in Mogadishu Somalia the findings are useful in assessing the level of exposure to toxoplasmosis. The rates of infection with toxoplasmosis reported in this study was 76.6% Have been screened of toxoplasmosis but greater than Other study in USA had variable results but most were concerned with the prevalence in the total population, where it was found to be 80.4% (21) and higher than those reported in neighbouring countries such as Saudi Arabia (22,23). In Saudi Arabia prevalences of 32.7% and 25.0% were reported.

The significant increase in the level of toxoplasmosis infection with increasing age reported in this study was also confirmed in the above studies. This rising trend with age, reflects the continuing risk of infection throughout adult life and arises from the cumulative risk of exposure and infection with age in an environment where transmission is encouraged by the high density of feral cats arises from the cumulative risk of exposure and infection with age in an environment where transmission is encouraged by the high density of feral cats.

### **5.3 Conclusions**

The present study had identified prevalence of toxoplasmosis among suspected females in Egyptian hospital in Mogadishu Somalia. It also pointed out such complications like Abortion which was mentioned thirty five of the respondents, while twenty five percent said sepsis or septic shock, nine teen percent were mentioned infertility, while fifteen percent said encephalitis, this indicate that majority of this people where mentioned Abortion where the danger complication Toxoplasmosis on pregnant women.

This study showed that When the respondent were asked to complication of toxoplasmosis to the baby, In this study thirty five of respondents said I don't know, while thirty percent said neurological abnormality, twenty percent said Intrauterine growth retardation, while ten percent said Convulsion, and only five percent said hydrocephalus.

This study found statistically significant risk factors for toxoplasmosis. In Multivariate logistic regression of the risk factors investigated were significantly associated with the risk of toxoplasmosis. These findings were similar to results by Nissapatorn, et al (2003) in which significant association was contact with cat, this indicated that forty five percent mentioned contact with cat, while at same number also mentioned Eating raw or undercooked vegetables , and ten percent said contact dirt soil. However, other studies investigating risk factors for toxoplasmosis identified owning cats to be a risk factor for toxoplasmosis (Baril, et al., 1999). Cleaning the cat litter box, eating raw or undercooked meat and vegetables and age were identified as risk factors for toxoplasmosis in Norway (Georg, et al., 1996). More recently a study in Zambia identified blood transfusion as a risk factor for toxoplasma infection (Sinyangwe, 2009).

### **5.4 Recommendations**

Based on the findings in this study, the followings were recommended.

- ✓ To avoid contact with material potentially contaminated with cat feces and to avoid ingestion of raw or badly-cooked meat or sub-products.

- ✓ To manage and make early diagnosis of the mother, the fetus and the newborn, and avoiding actions that can cause transplacental transmission of the parasite, through therapeutic intervention in pregnant women and child presenting acute infection.
- ✓ To support People in the high-risk group, in Banadir hospital, mainly seronegative pregnant women and immune compromised patients, must avoid contact with cats, soil, as well as handling and consumption of raw meat and its byproducts.
- ✓ To increase in collaboration of MoH with the health facilities in Banadir hospital and should design strategies to help community strengthen their knowledge on the effects of toxoplasmosis on pregnant women and their child to reduce toxoplasmosis,
- ✓ To make further large scale research should be carried out in this study area that could resolve the limitation of this study.

## APPENDIX I: REFERENCES

- Akinbami, A.A., Adewunmi, A.A., Rabiou, K.A., Wright, K.O., Dosunmu, A.O., Dada, M.O. and Adeyemo, T.A. (2010). Seroprevalence of *Toxoplasma gondii* antibodies amongst pregnant women at the Lagos State University Teaching Hospital, Nigeria. *Niger Postgrad Med J.*; 17(2): 164—167.
- Arko-Mensah, J. (1999). A serological survey of toxoplasmosis in pigs. M.Phil Dissertation, Department of Animal Science, University of Ghana, Accra, Ghana. pp 67-84.
- Ayeh-Kumi, P.F., Opoku, A.G., KwakyeNuako, G., Dayie, N.T.K.D., Asmah, R.H., Obeng Nkrumah, N., Lartey, M., Sagoe, A., Attipoe, M.I., Osafo, K.A. and Kretchy, J.P. (2010). Seroprevalence of toxoplasmosis among patients visiting the Korle-Bu Teaching Hospital, Accra, Ghana. *Reviews in Infect*; 1(3): 147-150.
- Ayi, I., Akao, N., Bosompem, K.M., Akafo, S.K., Clarke, J., Nyador, L., Apea-Kubi, K. and Fujita, K. (2005). Development of membrane-bases tests for the detection of urinary antigens and antibodies in human toxoplasmosis: preliminary studies in Ghanaian patients. *Acta Tropica*; 93:151-159.
- Charles, J. (2001). *Immunobiology*. 5th edition. Garland Publishing. New York, USA.
- Dubey, J.P., Lindsay, D.S., Speer, C.A. (1998). Structures of *Toxoplasma gondii* tachyzoites, bradyzoites and sporozoites and Biology and development of tissue cysts. *Clin Microbiol Rev.*; 11(2):267-299.
- Garweg, J.G., Scherrer, J., Wallon, M., Kodjikian, L., Peyron, F. (2005). Reactivation of ocular toxoplasmosis during pregnancy. *BJOG: Int J Obstet Gynecol*; 112 (2):241–242.
- Geisberger, R., Lamers, M. and Achatz, G. (2006). The riddle of the dual expression of IgM and IgD. *Immunol.*; 118 (4): 889-898.
- Gilbert, G. (2002). Infections in pregnant women. *Med J Aust.* ;176(5): pp. 229-236.
- Henrik, V.N., Sanne, L.L., Lone, CC., Søren, B., Anders, F. and Eskild, P. (1999). Complete protection against lethal *Toxoplasma gondii* infection in mice immunized with plasmid encoding the SAG1 Gene. *Infect Immun.*; 67 (12):6358-6363.

- Hill, D., Dubey, J.P. (2002). *Toxoplasma gondii*: Transmission, diagnosis and prevention. *ClinMicrobiol Infect*8: 634–640.
- Hippe, D., Weber, A., Zhou, L., Chang, D., Hacker, G., Luder, C. (2009). *Toxoplasma gondii* infection confers resistance against BimS-induced apoptosis by preventing the activation and mitochondrial targeting of pro-apoptotic Bax. *Journal of Cell Sci.*;122 (19): 3511–3521.
- Jacquire, P. (1995). Epidemiology of toxoplasmosis in Switzerland. *Schweiz Med Wochenschr Suppl.*; 65:29-38.
- Robert-Gangneux, F. and Darde, M.L. (2012). Epidemiology and diagnostic strategies for toxoplasmosis. *Clin. Microbiol. Rev.*; 25(2):264-296.
- Ryan, K.J., Ray, C.G. (2004). *Sherris Medical Microbiology*. 4th edition. McGraw Hill, New York, USA. pp 723-727.
- Saunders, M., Lewis, P., Thornhill, A. (2007). *Research Methods for Business Students*, 4th edition, Prentice Hall, New Jersey, USA.
- Selamawit, D. (2004). *Immunology and Serology*. Ethiopia Public Health Training Institute (EPHTI). Alemaya University, Ethiopia. pp. 27-46.
- Stray-Pedersen, B. (1993). Toxoplasmosis in pregnancy. *Baillieres Clin Obstet Gynaecol*; 7(1):107–137.
- Switaj, K., Master, A., Skrzypczak, M. and Zaborowski, P. (2005). Recent trends in molecular diagnostics for *Toxoplasma gondii* infections. *Clin Microbiol and Inf*; 11(3): 171-176.
- Wechsler, B., Le ThiHuong, D., Vignes, B., Piette, J.C., Chomette, G., Godeau, P. (1986). Toxoplasmosis and lupus. A review of the literature apropos of 4 cases. *Ann Med Interne. Paris*. pp 324–330.
- Wilson, M., McAuley, J.M. (1999). *Toxoplasma*. *Manual of Clinical Microbiology*, 7th edition. American Society of Microbiology, Washington, USA. pp 1374-1382.
- Zemene, E., Yewhalaw, D., Abera, S., Belay, T., Samuel, A. and Zeynudin, A. (2012). Seroprevalence of *Toxoplasma gondii* and associated risk factors among pregnant women in Jimma town, Southwestern Ethiopia. *BMC Infect Dis.*;12:337.

**APPENDIX II**

**BUDGET**

<b>S/N</b>	<b>Description</b>	<b>Amount in dollars \$</b>
1	Stationary and materials	\$4
4	Telephone	\$15
5	Meeting Costs	\$50
6	Laptop maintenance	\$30
7	Photocopy	\$16
	Internet	\$35
	Transportation	\$50
	<b>Total</b>	<b>\$200</b>

**APPENDIX III**

**TIME FRAME WORK**

<b>MONTHS</b>	<b>February</b>				<b>March</b>				<b>April</b>				<b>May</b>				<b>June</b>			
	<b>WEEKS</b>				<b>WEEKS</b>				<b>WEEKS</b>				<b>WEEKS</b>				<b>WEEKS</b>			
<b>ACTIVITIES</b>	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
<b>Selection of The Topic</b>																				
<b>Proposal Writing</b>																				
<b>Proposal Submission</b>																				
<b>Data Collection</b>																				
<b>Data Analysis</b>																				
<b>Report Writing</b>																				
<b>Reviewing and Proof Reading</b>																				
<b>Submission</b>																				