# Seroprevalence of Toxoplasmosis Antibodies among Obese Individuals

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## Abstract

**Background :**Obesity has been documented as an emerging important public health problem ; and few studies has been carried out to explore the role of infection as an environmental factor in a concept known as infect obesity , taking an example of Toxoplasma gondii infection in obesity pathogenesis.

**Objective :** The aim of current study was to show the role of Toxoplasmosis as a causal factor of obesity .

**Subjects and Method :** Randomly collected 276 subjects attending North oil company outpatient clinic were selected to be enrolled in the study, male to female ratio was 1:1 , their BMI was measured and calculated per WHO criteria .

Serum of all the included subjects was tested of according to available tests following the agreement of the participants on the informed concept .

**Results:** Out of 276 subjects of both sex in a ratio of 1:1 were included in the study , female had higher infection than male ; the highest infection rate was among low educational level (primary school ) 59% ;the obese with BMI >30 had highest infection rate ( 37%) and IgG level was higher than IgM in both groups .

**Conclusion :** It was concluded that their was positive causal relationship between obesity and Toxoplasma infection.

Key words : Toxoplasma, BMI , infectobesity .

## Introduction

Toxoplasma gondii is the causative agent of toxoplasmosisusually the infection is a symptomatic in adults; while in people with weak immune system a severform of thedisease may be obvious ; one of the most embarrassingSymptom seizer and poor coordination (1).

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The important  sequelae of the infection is when a pregnant lady getsthe infection which many lead to a condition known as as congenital toxoplasmosis (2).

Till  now few studies has   throws light on the detection of  antibodiesagainst Toxoplasma  in general populationandadolescents , which recorded  higher  prevalence of the infection  among Iraqi population in comparison  to near by countries , indicating  underestimated rate and concerning it a neglected public health  problem  (3).

Recently it has been documented that obesity is an important major public health problem and it is projected that in (2030), about 57% of the globe's population will get obese or over weight .

There are many emerging studies the role of infection as potential environmental factor in a concept known as (infectobesity) in obesity pathogenesis (4 ,5).

Toxoplasma gondi has been studied as a potential cause of obesity, being a common  parasite worldwide as infects  30%  of the population but the vast  majority of a asymptomatic.This parasite has many stages of development as the tachyzoite which is characteristic of acute infection stage then itprogressesto slowly  replication stage (bradyzoite)in immune competent  host , while the sexual reproduction occurs only if the parasite is  transmitted to a feline host (6).

In an experimental  study on rats  , it was clear  that  studied  sample has gained  weight  after  30 days  , followed   by weight loss; in has been postulated   from   the results   of the research thatinfection may has central effect on the brain ,affecting  hypothalamic  function  which  is triggered  by peripheral  inflammatory  process;  while  the single study  carried on human  showed no significant associationbetween  obesity  and the presence  of Toxoplasma  anti body .(7)

**The objective of the study;**

of the  currentstudy is  to try  to  find  an association between  different  levels of obesity  and  the antibody  titer  of Toxoplasma  gondii  among  peopleattending  north  oil  company clinic.
**Subjects and methods ;**

**Setting ;-**

The study  was  carried  out  on  (276 )patients   attending  out patient  diabetic  center  for early detection  of diabetesmellitus  with  no  symptoms  or  signs  related toToxoplasma  from  1Nov to 30 Dec 2019.

**Sample size and selection:**

**Defining obesity :**

According  toWHO  definition  obesity  was  defined  as body  mass  index  (B M I )  $\geq$30 , while non-obese  was  defined  as (BMI$<$  30) .

**The  available commercial  kit  was  used**  (medical - biozek kit )which  was  obtained  from source  ; and  one  - step test  was  performed  using  the  whole  blood  of all cases  to test  for the existence  of specific  anti – gondii IgG   ,  IgM  . accordingto the  manufacturer's  instructions(8).

**Methology ;.**

A total of 276 attendant to the diabetic center in North Oil Company/ Kirkuk were selected randomly to detect the existence of toxoplasmosis antibody in their serum. Their ages were ranging from 40 -70years old they have been grouped according to BMI to obese and non-obese according to WHO classification ,while the IgG ,IgM antibodies were detected according to the described methods by the following procedure.In this study,serum samples were analyzed for IgM and IgG antibodies by ELISA method by using method available kits (CODE:TOXM02 and TOXG01 BIOACTIVA DIAGNOSTICA. GERMANY, ELx800 instrument Biotek,USA).Briefly, one of the wells of the plate ELISA kit as blank. Next were added 100 uL of the standards, positive, negative controls and sample into selected wells plate. The wells were incubated for thirty minutes at room temperature. At the end of thirty minutes, the content of the wells were drained and then washed 5 times with wash solution. Except the blankone,100uL of the enzyme conjugate was added into each one and incubated for 30 min at room temperature.Then, contents of the wells were emptied and the wash cycle was repeated.To all wells, 100uL of TMB (tetra methyl blue) substrate solution was added and incubated for exactly 15min at room temperature in the dark. For stoping the reaction of stop solution was added. Absorbance plate wells were read at wavelength of 450-620nm with a plate reader within 30 minutes. To calculate the mean absorbance values, all samples were duplicated.For interpretation of quantitive results in this study,IgG antibody levels greater than 50IU/ML were positive. Toxoplasma IgM antibody were detected in the levels more than 8 UL/mL was considered positive.(8)

**<u>Stander curve toxoplasmosis IgM and IgG ANTIBODY</u>**



Toxo. IgM $y = 0.0253x - 0.0146$ $R^2 = 0.999$

## toxo IgG

$y=0.006x - 0.054$
$R^2=0.991$
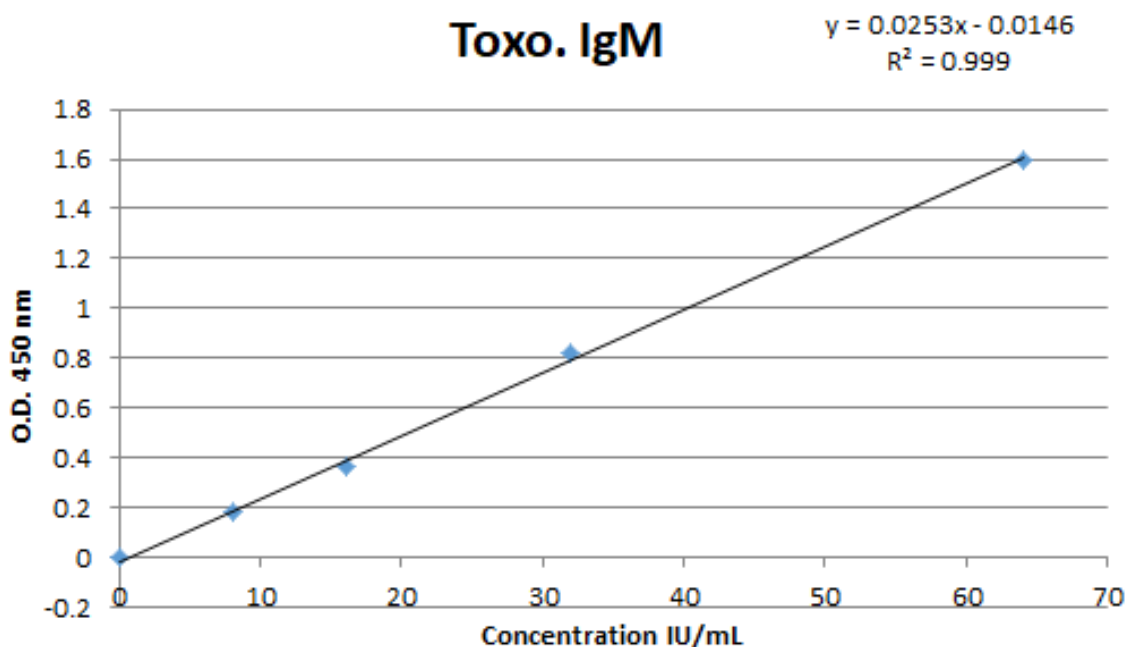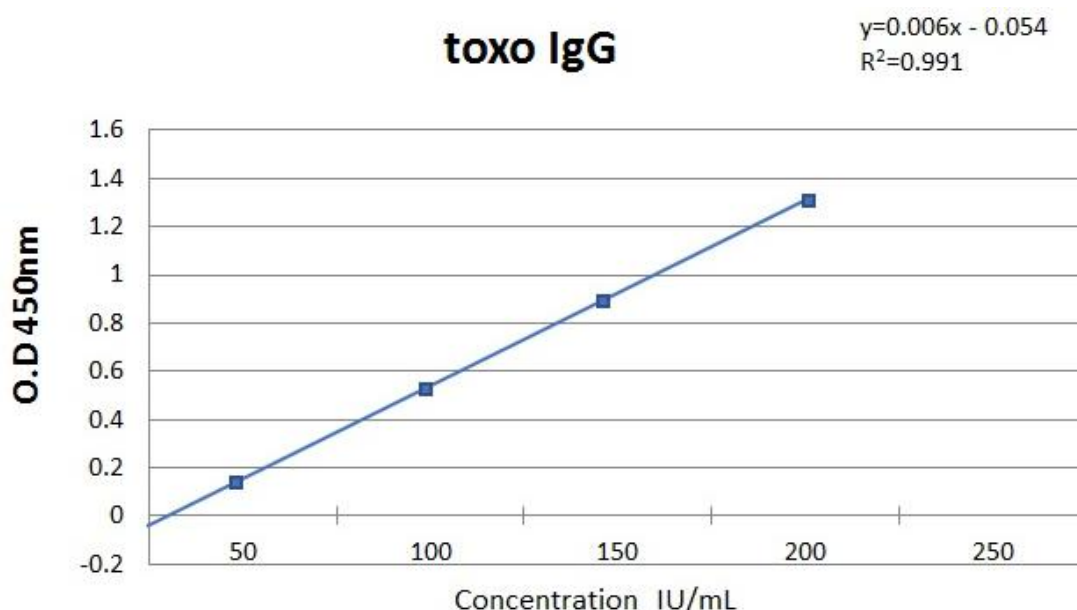


## Statistical analyses

The data were analyses using SPSS version 20 using both description and analytical approach to show the comparison and level of significance among group with P value equal to 0.05 as significant level (9).

## Ethical approval

An informed consent was obtained from eachparticipant and official approval was completed from directory of health per MOH recommendations.

**Result:**Out of 276 enrolled participants in the current study , 146 were male and 130 were female in a ratio of male to female as 1 : 1. The percentage of female with positive anti _toxoplasma antibody was higher (98.43/o) than male (37.6%) with highly significant differences ,P value binge < 0.00. according to table -1- .

## Table (1)

### Demographic data of study sample

| Parameter    T-gondi  seropositivity | | | | |
|---|---|---|---|---|
| **Sex** | **Positive  sero +ve No . (%)** | **Negative  sero –ve No .(%)** | **Total** | **p - value** |
| **Male  = 146** | **55 (37.6%)** | **91(62.4%)** | **146** | **o.oo<** |
| **Female  = 130** | **128(98.4%)** | **2(1.6%)** | **130** | |
| **total** | | | **276** | |
| **Age** | | | | |
| **<39 years** | **22(12)%** | **28 (30%)** | **50** | |
| **40 _ 49** | **86(47%)** | **4 ( 4%)** | **90** | **<0.001** |

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| | | | | |
|---|---|---|---|---|
| >50 years = 136 | 75 (41 % ) | 61 (66 % ) | 136 | |
| total | 183 (100%) | 93(100 %) | 276 | |
| **Education** | | | | |
| **Primary school** | 99 (54 % ) | 15 (16 % ) | 114 | **<0.001** |
| **Secondary school** | 71 (38.7 % ) | 59 (63 % ) | 130 | |
| **High school** | 13 ( 7.1 % ) | 19 (21 %) | 32 | |
| **total** | 183 (100%) | 93 (100 %) | 276 | |

In linking the percentage of antibody positivity with age, it was clear that highest age group affected by in the infection was the group of 40_49 years , while the lowest was among age group <39 years , concerning the correlation between the antibody existence and education level of participants a diverse relation was declared as the highest level ofpositivity was among a primary school level (54%) while the lowest was among those with high school (7.1 %).

In observing as association of infection with BMI , it was obvious thatparticipants with over weight and obesity (BMI 25 _ ≥ 30) had the highest positive antibody (71%) with those with normal (BMI) had the lowest percentage 28% ) as in table (2).

**Table -2**
**Association of Toxoplasmosis with BMI**

| BMI | Study sample No =276 | | Total % |
|---|---|---|---|
| | **Sero +ve** <br> **No. (%)** | **Sero _ve** <br> **No . (%)** | |
| < 24.9 | 51 (28 %) | 30(32.3%) | 81(29.1%) |
| 25 < 30 | 63(34.4%) | 30(32.3%) | 93(33.6%) |
| Obese≥ 30 | 69(37.60%) | 33(35.40%) | 102(37%) |
| total | 183(100%) | 93(100%) | 276(100%) |

On testing the samples for the type of antibodies against toxoplasma , it was the predominant type was IgG (58 %) followed by IgM (24%) out of total 69 affected participants as shown in table 3

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.**Table - 3**
**Association of T-gondii antibodies with obesity among study sample**

| gondi-T | | |
|---|---|---|
| Anti –body | Obese ≥ 30BMI | Non – obese <24.9,BMI 25> 30 |
| IgM(+ve) | 29(24%) | 36 (31.5%) |
| IgG (+ve) | 40(58%) | 78(68.5%) |
| total | 69(100%) | 114(100%) |

**Discussion**

Toxoplasmosis is a parasitic disease caused by Toxoplasma gondii,human being can contract the infection from contaminated food or water with oocysts of under cooked meat, infected cat faces or from mother to child during pregnancy (1)

Obesity being a common public health problem and mostly related to eating habits, so infection by toxoplasma may be associated with ,increasing thy risk of contaminated food like fast food as eating double portions of meat with increase the risk by two folds (6).

In study done in Mexico, aiming to show association between obesity and sex , female had higher percentage the male (10) , this was in agreement with the current study where female had the higher infection rate . In Germany a nationwide study was carried out to show the association between obesity and sero- positively of toxoplasma anti body and the result showed that obesity (BMI) was an independent factor by infectivity presented as IgG (11).

Carter pustulated that obesity is ((a state of chronic inflammation ))and it is plausible that T.Gondi infection could be involved in T2 -D M and obesity (12).

In a research carried on by Reeves and colleagues ; it was reported that a strong positive association was found between obesity and sero-positivety of T. gondii by a two fold odd among obese(BMI>30)in comparison to seronegative individuals, as P value being 0.01; they have hypothesized that infection with T. gondii may stimulate reward _ driven behavior as over eating (6).

It was been reported that anti - toxoplasma seropositivity increases with age , and it was suggested that correlation may be due exposure to environmental factors that's might aggravate the risk of transmission of the infection (13).

An indirect correlationbetween obesity and T._gondi was speculated by possibility that Toxoplasmosis may lead to activation of auto-immunity pathways by provoking the inflammation of I slets in the pancreas leading to (insulitis ) and developing diabetes , and leading in proper phagocytosis and provoking intracellular response to candida and Toxoplasma being both intracellular pathogens(14).

**Conclusion**: it was concluded from the current study there was positive correlation betweenToxoplasma gondii infection and obesity as both being chronic inflammatory condition.

**Recommendations** :. It Is recommended to carry out further in -depth analysis of the correlation between obesity by its different levels sand their outcome on large scale prospective future researches.

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