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Prevalence of toxoplasmosis among cancer patients in Thi-Qar province

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Abstract: Toxoplasmosis is infectious disease that is spread all over the world caused by one of opportunistic parasite called *Toxoplasma gondii*. The current study was conducted in Thi-Qar province to investigate the parasite *Toxoplasma gondii* among cancer patients using Enzyme Linked Immunosorbent. Assay test and study some of the factors that may affect in the prevalence of infection, such as age, sex and a number of chemical dosing. 100 blood samples were collected from cancer patients from Hussein Teaching Hospital and the Habboubi Hospital for the period from October 2015 to the end of March 2016. Questionnaire was prepared for each person, as well as the collection of 50 blood samples from healthy persons for the purpose of comparison between them with the current study. The results of the current study showed that the prevalence of toxoplasmosis in Thi-Qar province in cancer patients and a comparison group of 36% and 24% respectively. Recorded results of Enzyme Linked Immunosorbent Assay ELISA test results for a positive antibody IgG in cancer patients and a comparison, 30% , 22% respectively. As for the IgM antibody study did not record any positive result in cancer patients group while in comparison group was 2%. The ratios antibodies IgG & IgM together in cancer patients and comparison group were 6% ,0.0% respectively.The highest infection rates for cancer patients was in the age group (50-59 years) was 53.85% and the lowest rates of infection in the age group (30-39 years) 14.29% and reported significant differences $P < 0.05$ to infection rates in females highest compared to males where it was 38.59% and 32.55% respectively. For factor chemical dosing showed high infection rates in patients who have been exposed to more than one dose of a chemical 37.63%. As for those who were not exposed to any chemical dose was ratios have 14.29%.

Keywords: *Toxoplasma gondii* ,Toxoplasmosis, Cancer patients, Prevalence, ELISA, risk factors.

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Introduction:

Toxoplasmosis is an infection caused by *Toxoplasma gondii* that can be infected nearly all warm-blooded animals, and it can be found in cat faces which is considered only definitive hosts (1). Parasite infection occurred as a result of a transmission of three phases of middle and terminal hosts of oocytes with contaminated water and food, tissue cysts, in addition to it can catch it from contaminated meat or tachyzoites which is transmitted to baby from infected mother (2). Innate and acquired immunity play an important role to control infections and can prevent it causing disease later. However, immune system can be employed to decrease of parasite infection and transferred it into oocytes within tissue and this can be probably transferred from chronic to acute and this leads to make the parasite active again (3).

Toxoplasmosis is especially serious for people who have weakened immune systems such as cancer, organ transplant recipient who have taken immune inhibitor drugs and Haemodialysis and ADIS that make them more infected by multiple diseases (4). From previous decades *T. gondii* is the parasite that

causes toxoplasmosis for patients that have weakened immune systems like ADIS (5). Toxoplasmosis differs from person to person depending on infection intensity and immune status therefore most people who have toxoplasmosis never have any symptoms at all due to their good immune status or no signs or symptoms while people who develop symptoms may experience for example a fever, swollen lymph nodes for uterus, especially in the neck, a headache, muscle aches and pains and sore throat (6).

Toxoplasmosis is especially serious for people who have weakened immune systems. For these people, they're at risk of developing Spleenomegaly, Chorioretinitis, Pneumonitis andencephalitis (7).

Materials and Methods:

Data Collection:

The current study was conducted on cancer patients at different ages in both genders. Samples were collected from Al Hussein teaching hospital and Hobbi hospital during January 2015 to March 2016. The survey form included the age and chemotherapy doses for each patient.

Elisa test:

An Elisa assay (Bio Check) was used to measure toxoplasma IgG antibodies in human serum using antigen-coated polystyrene beads as a solid phase and anti-human IgG-horse radish peroxidase conjugate as an enzymatic tracer and then the samples were incubated and washed twice by washing buffer to remove unconjugated antibodies and finally Tetramethylbenzidine was added and the reaction was stopped using HCL (IN) as a stop solution. The results were taken compared to control.

Statistical analysis:

The data were analyzed by t-test and Chi-square using Spss software (8).

Results:

Prevalence of Parasite:

The results of the immunological diagnosis of the study showed that 36 (36%) samples were positive and 64 (64%) were Negative. Compared with healthy persons which resulted in 12 samples positive and by (24%) and 38 samples negative and by (76%). (Table 1).

Distribution of *Toxoplasma gondii* anti-bodies:

In the control group rate IgG , IgM and IgG&IgM antibodies were (22% , 2% and 0%) respectively showed a significant difference at $P < 0.05$. In cancer patients IgG, IgG & IgM and IgM, were (30%, 6% and 0%) respectively, at $P < 0.05$. (Table 2).

Categorize toxoplasmosis infection according to the Age:

In the current study, it has been found that the morbidity to toxoplasmosis through ELISA detection was higher in Age category between 30 to 39 years among healthy persons. Subsequently, there was no significant difference among variant age categories. Whereas in cancer patients , morbidity was higher in 50-59 years categories by (53.85%).Also, lower morbidity was 30-39 years in age category by (14.29%). Hence, there was no significant differences at $P>0.05$ level as shown in (Table 3).

Categorize toxoplasmosis infection according to gender:

Also this study has been detected that morbidity was higher in male by (33.33%) meanwhile in female was 13.04% for healthy people as well as there was no significant differences. Nevertheless in cancer pateints, morbidity was higher in female by (38.59%) comparing to male by (32.55%) as corresponding statistical analysis. There was notably.

In term of chemotherapy management:

It has been obviously stated that morbidity was more susceptible to patient who exposure to high dose of chemotherapy comparing patients who were exposing to low dose by (37.63%), (14.29 %) respectively. Consequently, there were higher significant differences at level $p<0.05$ (Table 5).

Table (1): Rate of *Toxoplasma gondii* infection in cancer patients compare with comparison group (healthy).

Group	ELISA test				Total	
	Positive		Negative			
	N	%	N	%	N	%
Control	12	24.0	38	76.0	50	100
Cancer Patients	36	36.0	64	64.0	100	100

Table (2): Distribution of *Toxoplasma gondii* parasite according anti-bodies type using ELISA test.

Group	Antibody	ELISA test				Total	
		Positive		Negative			
		N	%	N	%	N	%
Control	IgG	11	22	39	78	50	100
	IgM	1	2	49	98	50	100
	IgG & IgM	0	0	50	100	50	100
Statistical Analysis		X^2=8.33 ; df=2					
Cancer Patients	IgG	30	30	70	70	100	100
	IgM	0	0	100	100	100	100
	IgG & IgM	6	6	94	94	100	100
Statistical Analysis		X^2=16 ; df=2					

Tab. X^2 : df,2 ; α, 0.05 = 5.9914

Table (3): Categorize toxoplasmosis infection according to the Age.

Group	Age (year)	Anti-Toxoplasma		No Anti-Toxoplasma		Total	
		N	%	N	%	N	%
Control	20 -29	2	9.52	19	90.48	21	100
	30 -39	10	50	10	50	20	100
	40>	0	0	9	100	9	100
Statistical Analysis		X^2=5.333; df=2 Tab. X^2 : df,2 ; α, 0.05 = 5.9914					
Cancer Patients	30 -39	3	14.29	18	85.71	21	100
	40 -49	11	36.67	19	73.33	30	100
	50 -59	14	53.85	12	46.15	26	100
	60>	8	43.78	15	65.22	23	100
Statistical Analysis		X^2=7.333; df=3 Tab. X^2 : df,3 ; α, 0.05 = 7.8147					

Table (4): Categorize toxoplasmosis infection according to gender

Group	Gender	Total Numbers	IgG +ve N (%)	IgM +ve N (%)	IgG & IgM +ve N (%)	Total +ve N (%)
Control	Male	27	8(29.62)	1(3.70)	0(0)	9(33.33)
	Female	23	3(13.04)	0(0)	0(0)	3(13.04)
	Total	50	11(22)	1(2)	0(0)	12(24)
Statistical Analysis		X^2=8.33; df=2				
Cancer Patients	Male	43	12(27.90)	0(0)	2(4.65)	14(32.55)
	Female	57	18(31.57)	0(0)	4(7.01)	22(38.59)
	Total	100	30(30)	0(0)	6(6)	36(36)
Statistical Analysis		X^2=16; df=2				

Tab. X^2 : df,2 ; α, 0.05 = 5.9914

Table (5): Categorize toxoplasmosis infection according chemotherapy management.

Chemotherapy Management	ELISA Test				
	Total Numbers	Anti-Toxoplasma	%	No Anti-Toxoplasma	%
Yes	93	35	37.63	58	62.37
No	7	1	14.29	6	85.71
Statistical Analysis	X^2=32.11; df=1				

Tab. X^2 : df,1 ; α, 0.05 = 3.8414.

Discussion:

It is well established that *Toxoplasma gondii* has high virulence in patients with immuno-deficiency. That was throughout epidemiological studies using serological tests (9,10 and 11).

Current study documented morbidity toxoplasma in patients with cancer and comparing that with healthy people by using ELISA technique by (36% and 24%) respectively. This result was corresponding with previous studies have been done by (12 and 13). As referring to high morbidity could happened highly in patients with cancer as comparing to control group. It is known patient with cancer are suffering from immune suppression due to chemotherapy exposure that was acting on activation of parasite to percent wide spread of parasite (14).

Also, the results demonstrated that the variety of immunoglobulin concentrations between two study groups that was full agreement with study has been performed by (4).

The comparable results of previous study were comparability with other studies have been reffered by (15 , 16 and 17) in Thi-Qar province.

All these studies showed different concentration of immunoglobulin by (17.51%, 27.5% and 11.91%) for IgG as well as (3.5%,3.44% and 5.33%) for IgM respectively. Nevertheless, there was disagreement with study has been done by (18) which stated that concentration of IgM and IgG (40% and 11%) respectively. The high concentration IgG comparing to IgM that was attributing to long persisting of IgG concentration indicated that positive infection toxoplasma or continuous responding to latent infection (19).

According to spread among age categories study settled that cancer patients with 50-95 years appeared high morbidity by (53.85%) comparing to control group which represented by

50% in 30-39% years. It is worthy mention morbidity is increasing as corresponding to aging. That is compatible with previous study has been performed by (20) who referred to higher morbidity within age category less 34 years in some context agreement was with (21) as well as agreement with (15). However, this result disagreement of this study was previous studies that performed in west province by (22) which is revealed higher morbidity within age category 21-30 years by (71.79%) and les morbidity with aged category. In the same line have disagreement with present study that done by (23) in Tikreet and (24). They are showing morbidity occurred without age categories less than 30 years. This increasing in morbidity according to the age may be attributed to long duration exposure to pathogen causes with aging (25), (26). As well as, immune activity factor (21).

This study confirmed that there was significant differences at level $p<0.05$ in prevalence of infections toxoplasmosis as comparing between both gender, more over male have more susceptible to infection with parasite than female. These results were comparable to result of previous study in Malaysia (27). On the other hand, this work is disagreement with other former studies have been achieved by (28) in Baghdad, (29) and (30).

According to patient with cancer, the result of this study has full compatibility with results have been documented by (13) which identified infections susceptibility of cancer patients as comparing to healthy persons.

Some previous studies referred to high morbidity is more spread among female with cancer than other variables according to (31), (17). Meanwhile, that was different with study has done by Al-Ttae which demonstrated male with cancer more susceptible. As well as, this results were similar with (32) and (33). This issue of responding infection in gender difference is still not understood yet, it is thought that attributed to internal reactions within host or parasite more endocrine system is effecting on all body systems (34).

Furthermore, in cancer patients who are under going to chemotherapy management, study revealed that patients would high influence infections parasite especially who are under high dose of chemotherapy. This is because chemotherapy acts on immune suppression.

References:

1. Nelson, K.E. and Williams, C. M. (2014). Infections disease epidemiologt. ***Third edition Burlington, MA: Jones&Bartlett Learning.***
2. Montoya, J.G. and Remington, J.S. (2008). Management of *Toxoplasma gondii* infection during pregnancy. ***J.Clin. Infect. Diseases***., 47(4):554-566.
3. Joynson, D.H. (1999). Emerging parasite infection in man. infection. ***Dis. Rev***.,.2: 131-134.
4. Yazar, S.; Demirtas F.; Yalçin, Ş.; Yaman, O.; Tokgöz, B.; Utaş, C. and Şahin, I. (2003). Anti-*Toxo-plasma gondii* antibodies in haemodialysis patients with chronic renal failure. ***Yonsei Med. J***., 44 :288-292.
5. Ferreira, M.S. and Borges, A.S. (2002). Some aspects of protozoan infections in immunocompromised patients: *a review*. ***Mem Inst Oswaldo Cruz***, 97: 443–457.
6. Daryani, A.; Mehdi, S.; Sayed, H.H.; Sayed, A.K. and Shirzad, G. (2010). Serological survey of *Toxoplasma gondii* in schizophrenia patients referred to Psychiatric Hospital, Sari City, Iran. ***Tropical Biomedicine***, 27(3): 476-482.
7. Montoya, J. and *Liesenfeld*, O. (2004). "Toxoplasmosis." ***Lancet***, 363 (9425): 1965-1976.
8. Al-beldawi, A.A. (2008). Analysis ways by using SPSS program. 44.

9. Fayer, R.; Dubey, J.P. and Lindsay, D.S. (2004). Zoonotic protozoa: from land to sea. ***Trends Parasitol***., 20(11): 531-536.
10. Dubey, J.P. (2009). Toxoplasmosis in sheep-The last 20 years. ***Veterinary Parasitology*** .163: 1-14.
11. Dubey, J.P. (2008). The history of *Toxoplasma gondii* —The First 100 Years. ***J. Eukaryot. Microbiol***.,55:467–475.
12. Nimir, A.; Othman, A.; Ee, S.; Musa, Z.; Abd Majid, I.; Kamarudin, Z.; Xian, C. and Isa, N.H. (2010). Latent Toxoplasmosis in Patients with Different Malignancy. ***J. Clin. Med. Res***., 3:117-120.
13. Ghasemian, M.; Maraghi, Sh.; Saki J. and Pedram, M. (2007). Determination of Antibodies (IgG, IgM) against *Toxoplasma gondii* in Patients with Cancer. ***Iranian J. Parasitol***., 4: 1-6.
14. Israelski, D.M. and Remington, J.S. (1993). Toxoplasmosis in patients with cancer. Clin Infect Dis; 17 (suppl 2): S423-35. ***J. Parasitol***., 28(7):1019-1024.
15. Algezi, S.J. (2012). Diagnostic study of *Toxoplasma gondii* and cytomegalo virus in pregnant and aborted women with some immune and epidemiological indicators in Thi-Qar province. **Master thesis education college for pure science, Thi – Qar university**. pp:150.
16. Al-obodi, R.K. (2014). Diagnostic study for *Toxoplasma gondii* and rubella virus in aborted women by ELISA and Real time PCR in Thi-Qar province. ***Master thesis, education college for pure science, Thi-Qar university.***
17. Al-mussewi, R.A. (2014). Epidemiological and daignistical study of *Toxoplasma gondii* among students of Thi-Qar university by using ELISA and real time PCR methods. ***Master thesis, college of science Thi-qar university***.
18. Nuha, J.H. (2011). Prevalence of antibodies to Cytomegalovirus, Rubella virus and *Toxoplasma gondii* among aborted women in Thi-Qar province. ***Journal of education of college***. 5(1):2-5.
19. Remington, J.S.; Mcleod, R.; Thulliez, p. and Desmonts, G. (2001). Toxoplasmosis in: Remington,J.S. and Kiein,J. (eds) **Infectious Disease of the Fetus and New borne infant**, 5th edn.Philadelphia, PA:W.B Saunders, 205-346.
20. Fallah, M.; Rabiee, S.; Matini, M. and Taherkhani, H. (2008). Seroepidemiology of toxoplasmosis in primigravida women in Hamadan, Islamic Republic of Iran, 2004. ***Eastern Mediterranean Health Journal*****,** 14. (1); 163-171.
21. Hung, C.C.; Fan, C.K.; Su, K.E.; da Conceicao dos Reis Ferreira, M.; de Carvalho, J.M.; Cruz, C.; Lin, Y.K.; Tseng, L.F.; Sao, K.Y.; Chang, W.C.; Lan, H.S. and Chou, S.H. (2007). Serological screening and toxoplasmosis exposure factors among pregnant women in the Democratic Republic of Sao Tome and Principe**.** 2Trans. R. **Soc. *Trop. Med. Hyg*.,** 101:134- 139.
22. Alkhanag, M.N. (2009). Serological study for *Toxoplasma gondii* in pregnant women in Waset province. **Master thesis, education college, Al Qadisia university**, 133.
23. Al-kenani, S.S. (2004). Role of some parasitic infestation in immunosuppressing cancer patients. **Master thesis, college of science, university of Al mustenseria**,102
24. Jana, M.A. (2006). Study of some immunological indicators of serums women infected with Toxoplasma gondii. **MSc thesis. University of Baghdad, Baghdad, Iraq**. 109.
25. Alvarado-Esquivel, C.; Estrada-Martínez, S. and Liesenfeld, O. (2011). *Toxoplasma gondii* infection in workers occupationally exposed to unwashed raw fruits andvegetables: a case control seroprevalence study. ***Parasites & Vectors***, 4(235): 1-7.
26. Hasan, S.F. (2011). Seroprevalence of Toxoplasmosis Among comers to marriage in Kerbala governorate. Kerbala. ***J. Pharmaceutical Sci.***, 2:97-110.
27. Nissapatorn, V.; Leong, T.H.; Lee, R.; Init-Ithoi; Ibrahim, J. and Yen, T.S. (2011). Seroepidemiology of Toxoplasmosis in Southeast Asian. ***J. Trop. Med. Public Health*** 2:237-244.
28. Abdul-Aziz, A.I. and Zghair, K.H. (2014). Study of Epidemiology of Toxoplasmosis in Hemodialysis Patients in Baghdad Hospitals. ***Iraqi Journal of Science*** ,55: 1236 -1242.
29. Al-Shikly A.M. (2008). Serological study of *Toxoplasma gondii* antibodies in some Universities students in Baghdad province. **MSc thesis. University of Baghdad, Baghdad, Iraq**.
30. Mohammad, Kh. (2012). Evaluation of infection with Toxoplasmosis for pregnant women in Diyala province. ***Diyala Journal for Pure Science*****,** 8(2):1-8.

31. Al-greri, E.J. (2007). Serological and epidemiological study for *Toxoplasma gondii* in Deyala province Iraq.master thesis ***Deyala university, education college***. 94.
32. Coelho, R.A.; Kobayash, M. and Carvalho, L.B. (2003). Prevalence of IgG antibodies specific to *T gondii* among blood donors in Recife,Northeas toxoplasma ***Brazil. Rev. Inst. Med. Trop.,*** 45: 229-231.
33. Uneke, C.J.; Duhlinska D.D.; Ngwu, B.A and Njoku, M. O. (2007). Seroprevalence of *Toxoplasma gondii* infection in Kwal, a rural distraction of Plateau- Nigeria. ***African J. of Med. Sci***., 36:109-113.
34. Klein S.I. (2004). Hormonal and immunological mechanisms mediating sex differences in parasite infection. ***Parasite Immunol.,*** 26 :247-264.