

How to Cite:

Sulaiman, D. A., & Noori, R. A. (2022). Evaluation of Malondialdehyde as a biomarker in investigation of *Toxoplasma gondii* in infected women. *International Journal of Health Sciences*, 6(S5), 8136–8141. <https://doi.org/10.53730/ijhs.v6nS5.10844>

Evaluation of Malondialdehyde as a biomarker in investigation of *Toxoplasma gondii* in infected women

Duaa A. Sulaiman

Department of Laboratory investigations, Faculty of science, University of Kufa, Iraq

Email: duaa.alhamdany1993@gmail.com

Rasha Aamer Noori

Laboratory of investigation, Faculty of science, University of Kufa, Iraq

Email: rashaa.altufaili@uokufa.edu.iq

Abstract--This study was aimed to estimate the prevalence of *Toxoplasma gondii* infection and associated risk factors among patients in Al-Najaf Province and to investigate whether there is a relationship between this infection and (MDA). A total of 117 blood samples were collected from Iraqi women with toxoplasmosis at Al-Zahra Teaching Hospital for Maternity and Children in AL-Najaf province. The PCR test was carried out in the Advanced Research Laboratory of the Department of Laboratory Investigations / Faculty of Science – University of Kufa. The estimation of MDA marker level in patients and 30 healthy women (control group) was conducted in Al-Ameen Center for Research and Advanced Biotechnology/ Imam Ali Holy Shrine. The results of the PCR (to confirm the toxoplasmosis infection) had shown that 53(45.30%) patients were found positive and 64 (54.70%) were negative. The results of biochemical study showed that the concentrations of MDA level were increased in toxoplasmosis patients compared with the controls. The results of this study highlight on the wide spread of Toxoplasmosis in Iraq, especially in Najaf Governorate. The use of molecular methods to diagnose toxoplasmosis remains the most accurate technique for diagnosing infection.

Keywords---Genotyping, *Toxoplasma gondii*, B1gene, Relation, Malondialdehyde.

Introduction

Toxoplasma gondii, an obligate intracellular protozoan parasite with noteworthy zoonotic importance, causes toxoplasmosis in humans and warm-blooded animals (Ybañez *et al.*, 2020). Consumption of raw or uncooked meat and fish containing bradyzoites (water, milk, and vegetables contaminated with oocysts) and transfusion and transplantation of blood and organs, respectively, harboring tachyzoites from patients infected with *T. gondii* are the major sources of *T. gondii* infection in humans (Kolören and Dubey, 2020). As a final host, cats play an important role in spreading *T. gondii* infection (Dubey, 2009). Therefore, poor hygienic management of farms, climate presence of cats in farms, consuming raw or uncooked meat and vegetables, and inter-current diseases may act as potential risk factors influencing this disease (Ferra *et al.*, 2020). The sexual life cycle of *T. gondii* is restricted to cats; however, the asexual cycle depends on humans and other intermediate hosts (Dubey *et al.*, 2020). The prevalence range of toxoplasmosis has remarkably increased in humans and animals (Asgari *et al.*, 2006; Nasiru *et al.*, 2020). The highest risk of toxoplasmosis is due to congenital infection of the fetus during pregnancy, patients with an immunity disorder such as AIDS, recipients of organ transplants, and immunosuppressive drug users, in which the parasite spreads into the organs and destroys their tissues, leading to severe complications (Montoya and Liesenfeld, 2004; fonso, *et al.*, 2009). MDA is a highly reactive aldehyde that oxidizes and destroys tissues. MDA belongs to the thiobarbituric acid reactive substances (TBARS) family in. As a consequence, the TBARS test is often used to determine MDA concentration due to its ease of use (Dalle *et al.*, 2006). TBARS and MDA are the most important markers of oxidative stress and lipid peroxidation in biological samples (Rahal *et al.*, 2014).

Materials and Methods

Sampling of cases

A) Study group: A total of 117 blood samples were collected from Iraqi women with toxoplasmosis at Al-Zahra Teaching Hospital for Maternity and Children in AL-Najaf province. They previously detected as *Toxoplasma* positive cases by using the Vitek Immuno-Diagnostic Assay System (VIDAS) for detection of immunoglobulins toxoplasma antibodies. The PCR test was carried out in the Advanced Research Laboratory of the Department of Laboratory Investigations / Faculty of Science – University of Kufa. The estimation of oxidative stress markers (MDA) level was conducted in Al-Ameen Center for Research and Advanced Biotechnology / Imam Ali Holy Shrine.

B) Control group: It consists of 30 healthy women; all were without any inflammatory disorders or clinical manifestation of any disease. The tests were carried out on 5 mL of venous blood drawn from each subject. 2 milliliters were gathered in anticoagulant EDTA vials and utilized in the testing of PCR to confirm the *T. gondii* infection. 3 ml was collected in gel tubes and centrifuged for 5 minutes at 3000 rpm. The serum was placed into a 1.5milliliter microcentrifuge tube and kept at -80°C for subsequent utilize in estimation of oxidative stress marker (MDA) level. This marker was measured for only the PCR positive samples and controls (Alhasnawi and Aljanaby, 2022; Aljanaby et al., 2022; Abdulla et al., 2022; Al-Hadraawy et al., 2022).

Results and Discussion

From Table 1 it can be noted that the concentration level of MDA is increases in patients compared with the control this may be due the reason for the high concentration of Malondialdehyde (MDA) is due to the increased production of free radicals that lead to more lipid peroxidation and then higher oxidative damage in cellular membranes. This includes placenta membrane damage and is due to lipid peroxidase inhibiting the synthesis of prostaglandin I 2 enzyme, thus causing this enzyme to malfunction, and then the vessels shrink Hematopoietic and platelet aggregation. This is followed by the anemia of ischemia and increased cell damage. Thus, the occurrence of abnormal placentation is due to an enlarged oxidative process, as well as an elevation in the concentration of MDA. It was found that time increases with an increase in the number of times the previous miscarriages (Mohammed A., *et al.*, 2020).

Table 1
The MDA concentrations in control and toxoplasmosis patients

Parameters	Groups		P-value
	control N (30) Mean \pm SD	Patients N (53) Mean \pm SD	
MDA (nmole/ml)	0.201 \pm 0.083	1.074 \pm 0.447	0.0001*

*means significant difference at ($P \leq 0.05$)

Conclusion

The results of this study highlight on the wide spread of Toxoplasmosis in Iraq, especially in Najaf Governorate. The use of molecular methods to diagnose toxoplasmosis remains the most accurate technique for diagnosing infection.

References

- Abdulla, NY, Aljanaby, IAJ, Hasan, TH, Aljanaby, AAJ. (2022). Assessment of β -lactams and Carbapenems Antimicrobials Resistance in *Klebsiella Oxytoca* Isolated from Patients with Urinary Tract Infections in Najaf, Iraq. *Archives of Razi Institute*. 77 (2):669-673
- Abu-Dalbouh M.A, Ababneh M.M, Giadinis N.D, Lafi S.Q. Ovine and caprine toxoplasmosis (*Toxoplasma gondii*) in aborted animals in Jordanian goat and sheep flocks. *Trop. Anim. Health Prod.* 2012;44(1):49–54. [PubMed] [Google Scholar].
- Alfonso Y., Fraga J., Jim´enez N., Fonseca C., Dorta-Contreras A.J., Cox R., Capo V., Bandera F., Pomier O., Ginorio D., Detection of *Toxoplasma gondii* in cerebrospinal fluid from AIDS patients by nested PCR and rapid identification of type I allele at B1 gene by RFLP analysis, *Exp. Parasitol.* 122 (2009) 203–207, <https://doi.org/10.1016/j.exppara.2009.03.009>.
- Al-Hadraawy SK, Alhadrawi KK, Aljanaby IAJ, Aljanaby AAJ and Zabibah RS.(2022). Prevalence of pulmonary tuberculosis in Al-Najaf governate, Iraq.. *F1000Research*. 11:675
- Alhasnawi HMR and Aljanaby AAJ.(2022). The immunological role of CD4 and CD8 in patients infected with *Helicobacter pylori* and stomach cancer. *Gene Reports*. 26,101500. <https://doi.org/10.1016/j.genrep.2022.101500>
- Aljanaby AAJ, Qassim Muhsin Hashim Al-Faham QMH, Aljanaby IAJ, Hasan TH.(2022). Epidemiological study of *Mycobacterium Tuberculosis* in Baghdad .Governorate, Iraq. *Gene Reports*. 26,101467. <https://doi.org/10.1016/j.genrep.2021.101467>
- Asgari Q., Farzaneh A., Kalantari M., Akrami Mohajeri F., Moazeni M., Zarifi M., Esmaeilzadeh B., Motazedian M.H., Seroprevalence of free-ranging chicken toxoplasmosis in suburban regions of Shiraz, Iran. *Int. J. Poult. Sci.* 5 (2006) 262–264, <https://doi.org/10.3923/ijps.2006.262.264>
- Ayo C.M., Frederico F.B., Siqueira R.C., De Mattos C.D.C.B., Previato M., Barbosa A. P., Murata F.H.A., Silveira-Carvalho A.P., De Mattos L.C., Ocular toxoplasmosis: susceptibility in respect to the genes encoding the KIR receptors and their HLA class I ligands, *Sci. Rep.* 6 (2016) 36632, <https://doi.org/10.1038/srep36632>.
- Dalle-Donne, I.; Rossi, R.; Colombo, R.; Giustarini, D.; Milzani, A. 2006, Biomarkers of Oxidative Damage in Human Disease. *Clin. Chem.* 52, 601–623.
- Dhami, R. llah M. A.-A., Kadhim, B. M., & Abdullhusein, H. S. (2020). A serological study to diagnose the causes of recurrent viral and immune miscarriage in aborted women who attend the shatrah general hospital. *International Journal of Health & Medical Sciences*, 3(1), 42-47. <https://doi.org/10.31295/ijhms.v3n1.131>
- Dubey J.P, Pena H.F.J, Cerqueira-Cézar C.K, Murata F.H.A, Kwok O.C.H, Yang Y.R, Gennari S.M, Su C. Epidemiologic significance of *Toxoplasma gondii* infections in chickens (*Gallus domesticus*):The past decade. *Parasitology*. 2020;147(12):1263–1289. [PubMed] [Google Scholar].
- Dubey J.P. *Toxoplasmosis of Animals and Humans*. United States: CRC Press; 2009. [Google Scholar].
- Fernandez-Escobar M., Calero-Bernal R., Benavides J., Regidor-Cerrillo J., GuerreroMolina M. C., Guti´errez-Exposito D., Collantes-Fern´andez E., OrtegaMora L.M., Isolation and genetic characterization of *Toxoplasma gondii*

- in Spanish sheep flocks, *Parasites Vectors* 13 (2020) 1–14, <https://doi.org/10.1186/s13071-020-04275-z>.
- Ferra B, Holec-Gasior L, Grażlewska W. *Toxoplasma gondii* recombinant antigens in the serodiagnosis of toxoplasmosis in domestic and farm animals. *Animals*. 2020;10(8):1–27. [PMC free article] [PubMed] [Google Scholar].
- Kang KM, Lee GS, Lee JH, Choi IW, Shin DW, Lee YH. 2004. Effects of INOS inhibitor on IFN- γ production and apoptosis of splenocytes in genetically different strains of mice infected with *Toxoplasma gondii*. *Korean J Parasitol*; 42: 175–183.
- Kolören Z, Dubey J.P. A review of toxoplasmosis in humans and animals in Turkey. *Parasitology*. 2020;147(1):12–28. [PubMed] [Google Scholar].
- Kostyrykina N.A., Pechkovskiy E.A., Boyarskikh U.A., Sushko A.G., Voronina E.N., Lazarev A.F., Petrova V.D., Zarubina N.A., Selezneva I.A., Sinkina T.V., Terekhova S.A., Filipenko M.L., Associations of polymorphic variant of MnSOD gene with breast cancer in residents of the Altai Region, *Bulletin of Experimental Biology and Medicine* 147 (1) (2009) 84–87.
- Liu Q., Wang Z.D., Huang S.Y., Zhu X.Q., Diagnosis of toxoplasmosis and typing of *Toxoplasma gondii*, *Parasites Vectors* 8 (2015) 292, <https://doi.org/10.1186/>
- Mev'elec M., Lakhrif Z., Dimier-Poisson I., Key Limitations and New Insights Into the *Toxoplasma gondii* Parasite Stage Switching for Future Vaccine Development in Human, Livestock, and Cats, *Front Cell Infect Microbiol* 10 (2020) 607198, <https://doi.org/10.3389/fcimb.2020.607198>.
- Mammari N., Halabi M.A., Yaacoub S., Chlala H., Dard'el M.L., Courtioux B., *Toxoplasma gondii* modulates the host cell responses: an overview of apoptosis pathways, *Biomed. Res. Int.* (2019) 6152489, <https://doi.org/10.1155/2019/6152489>.
- Montoya J.G., Liesenfeld O., *Toxoplasmosis*, *Lancet* 363 (2004) 1965–1976, [https://doi.org/10.1016/S0140-6736\(04\)16412-X](https://doi.org/10.1016/S0140-6736(04)16412-X).
- Nasiru M., Mohd Moklas Wana M.A., Watanabe M., Nordin N., Zasmy Unyah N., Alhassan Abdullahi S., Ahmad Issa Alapid A., Mustapha T., Basir R., A Review on the Prevalence of *Toxoplasma gondii* in Humans and Animals Reported in Malaysia from 2008–2018, *Int. J. Environ. Res. Public Health* 17 (2020) 4809, <https://doi.org/10.3390/ijerph17134809>.
- Pas A.I., Ţiu , Cozma-PetruŢ A., Mercier A., Balea A., Galal L., Mircean V., Pusta D.L., Bogdan L., Gyorke A., Prevalence and genetic characterization of *Toxoplasma gondii* in naturally infected backyard pigs intended for familial consumption in Romania, *Parasites Vectors* 12 (2019) 586, <https://doi.org/10.1186/s13071-019-3842-8>.
- Rahal, A.; Kumar, A.; Singh, V.; Yadav, B.; Tiwari, R.; Chakraborty, S.; Dhama, K. 2014, Oxidative Stress, Prooxidants, and Antioxidants: The Interplay. *BioMed Res. Int.* 2014, 1–19.
- Russo J., Hu Y.F., Yang X., Russo I.H., Developmental, cellular and molecular basis of human breast cancer, *Journal of the National Cancer Institute. Monographs*(27):17–37 (2000).
- Shubair, M. (1993) Screening of Gaza Productive-Age Women for Toxoplasmosis. *Islamic Univ. J.* 1(2):28–38.
- Suryasa, I. W., Rodriguez-Gámez, M., & Koldoris, T. (2021). Get vaccinated when it is your turn and follow the local guidelines. *International Journal of Health Sciences*, 5(3), x–xv. <https://doi.org/10.53730/ijhs.v5n3.2938>

Tatiane De Rossi, Vanessa Jacob Victorino(2009).Lucas Freitas de Freitas, Ana Cristina da Silva do Amaral Herrera; Rubens Cecchini. Breast Cancer and Oxidative Stress in Chemotherapy. *Applied Cancer Research*;29(4),150-156.

Ybañez R.H.D, Ybañez A.P, Nishikawa Y. Review on the current trends of toxoplasmosis serodiagnosis in humans. *Front. Cell. Infect. Microbiol.* 2020;10(204):1– 8. [PMC free article] [PubMed] [Google Scholar].