

SEROLOGIC PREVALENCE OF TOXOPLASMOSIS IN WOMEN'S VISITING BAHAWAL VICTORIA HOSPITAL, BAHAWALPUR

M. H. Lashari¹, A. Waheed¹, S. Nasreen¹, M. Anam¹, A. A. Farooq², S. Inayat³, M. U. Saleem⁴, S. Murtaza², M. H. Shah²,
A. Basit⁴, M. A. Javid⁴, M. Arshad⁵ and S.G. Mohyuddin⁶

¹Department of Zoology, The Islamia University of Bahawalpur, Pakistan,

²Department of Clinical Sciences, Faculty of Veterinary Sciences, Bahauddin Zakariya University, Multan, Pakistan

³Department of Dairy Technology, University of Veterinary and Animal Sciences Lahore, Pakistan

⁴Department of Biosciences, Faculty of Veterinary Sciences, Bahauddin Zakariya University, Multan, Pakistan

⁵Department of Zoology, University of Sargodha Pakistan

⁶Key Laboratory for Animal Genetics, Breeding, Reproduction and Molecular Design of Jiangsu Province, College of Animal of Animal Science and Technology, Yangzhou University, Yangzhou 225009, China

Corresponding Author: mushtaq.hussain@iub.edu.pk

ABSTRACT: Background and objective: The aim of recent study was to find out the serological prevalence of toxoplasmosis, as well as the effect of *T. gondii* on biochemical parameters of women visiting Bahawal Victoria Hospital, Bahawalpur.

Method: The blood samples were obtained from the women visiting hospital and serum was stored. The Enzyme-linked Immunosorbent Assay measured the immunoglobulin G (IgG) antibodies of *T. gondii*.

Result: The overall prevalence of toxoplasmosis was 58.73%. age wise seroprevalence shows in age groups (years) 16-25, 26-33, 34-42, ≥ 42 was (50%), (63%), (55.55%) and (70%) respectively. The relationship between hosts disease and prevalence of toxoplasmosis in women suffering hepatitis B, kidney problem, arthritis, diabetes, nausea and thyroid abnormality, the parasitic prevalence was observed (57.57%), (33.33%), (50%), (57.14%), (75%), and (85.71%) respectively. The relationship between mother having total number of child 0-2, 3-5, ≥ 5 and prevalence of parasite was (62.96%), (60%), (33.33%) respectively. The prevalence of parasite in women belong different socio economic status poor, middle, rich and was (94.44%), (46.15%), (33.33%). There was significant difference between the parasitic prevalence and the host disease as well as socio economic status. The Mean $\pm$ SEM biochemical parameters in age (years), disease, socio economic status, number of child of women was comparatively higher in infected hosts as compared to non-infected hosts.

Conclusion: In conclusions the findings indicated there is a noticeable prevalence of *T. gondii* so that control and serological screening programs should be implemented in Bahawalpur for the reliable and fast detection of *Toxoplasma* infections.

Keywords: *Toxoplasma gondii*, Seroprevalence, Bahawal Victoria hospital (BVH).

(Received 17.11.2022

Accepted 15.03.2023)

INTRODUCTION

Toxoplasmosis the most widespread condition caused by the intracellular parasite, *Toxoplasma gondii* (*T. gondii*). Warm blooded animals as well as humans are equally infected by the parasite (Dubey and Beattie 1988). Infection is caused by intake of oocysts from contaminated nutrients or water, half cooked meat. Moreover, *T. gondii* can be transmitted from a mother to her fetus through the placenta and leads to severe complications such as miscarriage, stillbirth, chorioretinitis, cerebral calcifications, and hydrocephalus (Kieffer *et al.*, 2013; Sarkari *et al.*, 2015). Antibodies can be detected by various serological procedures like the

direct agglutination test, indirect fluorescent antibody assay (IFA), Enzyme-linked Immunosorbent Assay (ELISA) and the latex agglutination test. It has been estimated that up to one third of the world's inhabitants are infected by *T. gondii*, prevalence rates ranging from 0% to 100% in different countries has been observed (Olivier *et al.*, 2007). Different prevalence rate has been reported in women having child i.e in USA (11.0%) (Jones *et al.*, 2007), Greece (20%) (Diza *et al.*, 2005), Portugal (24%) (Lopes *et al.*, 2012), Brazil (64.9%) (Fernandes *et al.*, 2009) and Ethiopia (81.4%) (Gebremedhin *et al.*, 2013). Prevalence rates may vary country to country, depending on traditions, customs and the life styles of the inhabitants (Smith, 1991). Study about serological prevalence of *Toxoplasma gondii* has

been reported the in few areas of Pakistan but no detailed study has done in Bahawalpur before. So, the major purpose of current research was to determine serologic parasitic prevalence and assessment of variation in biochemical parameters, in females visiting Bahawal Victoria hospital (BVH), Bahawalpur, Pakistan on the bases of their age, number of children, disease, and socio-economic status. This is a preliminary study in this area need to be done with large number of populations.

MATERIALS AND METHODS

Study Range: The research was performed from August to December, 2019 in Bahawal Victoria Hospital, Bahawalpur southern Punjab, Pakistan. Area is known for warm arid subtropical temperature and annual temperature of the area is 28.33°C and exceeds upto 45°C in june (Farooq *et al.*, 2010).

Study Population: Blood samples (n=75) of women was collected from Bahawal Victoria Hospital Bahawalpur. Following data like patient's history, age, number of children, disease they are suffering from, and socio-economic status was obtained and ethical consideration was made.

Sample Collection and Serological analysis: Three ml blood sample was collected in serum actuating gel vacutainers. Samples were then transported to the pathology laboratory and left for 35 minutes at room temperature so that serum can be separated. The sample of serum were then shifted into viols. Out of 75, 12 were discarded due to clotting. So total number of samples were 63. For serological diagnosis blood serum was tested using commercially available *Toxoplasma* IgG Enzyme Immunoassay Test Kit. The assay was performed by following protocol of *Toxoplasma* IgG Enzyme Immunoassay Test Kit.

Biochemical Test: After serological tests serum samples from sixteen infected and fifteen non-infected hosts were subjected to determine the various biochemical parameters viz Aspartate aminotransferase (AST), bilirubin, albumin, Alanine aminotransferase (ALT), and urea determined. Samples were prepared by mixing reagents and serum in the test tube and then analyzed in BTS 350 Semi-Automatic Analyzer. The procedure was performed according to analyzers directions.

Statistical Analysis: For statistical analysis, Minitab software was used. Percentages indicated the overall seroprevalence whereas Means $\pm$ SEM presented those for biochemical analysis was written. The values between different aspects of hosts including, age groups, number of children, disease, and socio-economic status were analyzed by Chi square. The $P \leq 0.05$ was considered as statistically significant.

RESULTS AND DISCUSSION:

Overall prevalence: In current study 58.73% seroprevalence of *T. gondii* reported in female subjects visiting Bahawal Victoria hospital (BVH) Bahawalpur (Table 1). Higher seroprevalence than current study was reported in Pakistan and other regions of world like 62% in Lahore Pakistan (Jadoon *et al.*, 2011), 64.9% in Brazil (Fernandes *et al.*, 2009) and 81.4% Ethiopia. (Gebremedhin *et al.*, 2013).

While the lower seroprevalence than current was reported different regions of world and Pakistan like 11.0% USA (Jones *et al.*, 2007), 19.25% in District Swabi Pakistan (Faisal *et al.*, 2014), in 24% Portugal (Lopes *et al.*, 2012), 20% in Greece (Diza *et al.*, 2005), 34% in Southern Punjab (Tasawar *et al.*, 2012). There is noticeable prevalence rate in Bahawalpur because it is tropical and temperate region and lower prevalence of toxoplasmosis in colder areas from USA (Dubey and Jones 2008) and Iran (Sharif *et al.*, 2007).

Host age (years) wise prevalence: The current study shows maximum 70% seroprevalence of parasite within the age group (>42 years) and lower percentage 50% of infection within the age group (16-26 years) (Table 1). The results of the current study agreed with Nijem and Amleh1 (2009); Jassam, (2010), both reported highest seroprevalence in adult age groups and lowest prevalence in young ones age groups in their studies. The prevalence was directly proportional to the age group as age increase the prevalence increases. This may be due to different sources of infection, are found in different age groups, such as the contact with soil, and ingestion of undercooked meat in adult life (Lebech, *et al.*, 2009).

The Mean $\pm$ SEM value of the Urea(mmol/L), Bilirubin(μ mol/L), AST (U/L) ,ALT (U/L), and in different age groups of infected and non-infected individuals. Level of bilirubin's, ALT and Urea increases in youngsters as compare to adults while the level of AST increase in infected subjects (Table 2).

Host disease wise prevalence: The relationship between different diseases like Hepatitis B, kidney problem, arthritis, diabetes nausea, thyroid abnormality and prevalence of parasite shows statistically significant difference. Current study reported that the higher prevalence of parasite was found in host with thyroid abnormality (85.71%) and lower prevalence of parasite was found in host suffering from kidney problem (33.33%). These differences can be reported due to different study backgrounds in terms of varied weather conditions, diverse study population and risk factors like having pets, domestic animals, unhealthy hygienic practice, and eating pattrens (Zemene *et al.*, 2012; Agmas *et al.*, 2015; Abamecha and Awel 2016; Bamba *et al.*, 2017; Frimpong *et al.*, 2017). The study showed significant relation between *Toxoplasma gondii* and the

host suffering from hepatitis, diabetes, nausea, and arthritis which agrees with statement toxoplasmosis affects liver and kidney functions due to increase in the levels of some biochemical parameters in patients group; exhibit severe medical conditions such as pneumonia, hepatitis, blindness and severe brain abnormalities (Al-Fartusie *et al.*, 2012).

Mean±SEM value of various biochemical parameters in individuals suffering from Hepatitis, Kidney problem, Arthritis and Diabetes discussed in table 2. Level of bilirubin's, ALT an, AST and albumin significantly increased in infected women suffering from Hepatitis, kidney problem, arthritis and diabetes while the level of urea are significantly low. which differs from Hashims study in which the serum albumin and bilirubin significantly decreased in *T. gondii* infection patients compared to control group (Hashim *et al.*, 2017). High level of AST, ALT agrees with the statement that increased plasma AST and ALT activities reflects impairment of the liver (Viranuvatti, 1987). A metabolic variation can occur by liver damage which can cause decrease in liver protein synthesis. (Montoya and Liesenfeld, 2004).

Number of child and prevalence rate: The parasitic prevalence of toxoplasmosis in mother having; 0-2, 3-5, ≥5 child was (62.96%), (60%), (33.33%). The non-significantly high prevalence of parasite was found in mothers having 0-2 child (62.96%), and lower prevalence was found in ≥5 (33.33%) (Table 1). Prevalence of toxoplasmosis varies among countries, depending on traditions, customs and the life styles of the inhabitants (Smith, 1991). The Mean ±SEM value of various biochemical parameters in women having with different number of children. Level of bilirubin, ALT an, AST, urea and albumin are high in infected women (Table 2). Similar results were reported by Al Jowari and Hussein,

2014 they found significant ($P < 0.05$) increase in the means of AST, ALT and ALP activities in the serum of toxoplasmosis women compared with control group which supports the current results.

Host Economic Status and prevalence rate: In current study host divided into three groups on the basis of their economic status like poor, middle, rich having income (10,000-12,000), (15000-350000), and (50000-80000) was (94.44%), (46.15%), (33.33%). The significantly higher prevalence of parasite was found in host having poor social economic status (94.44%), and lower prevalence of parasite was found in host having rich social economic status (33.33%) (Table 1). Poor illiterate people are unfamiliar, unhygienic and absence of awareness. They are unable to afford treatment. Other factors include nutrition patterns, cultural, social and economic practices; the water quality; and hygiene coverage (Bahia-Oliveira *et al.*, 2003; Jones and Dubey 2010). The Mean ±SEM value various biochemical parameters in women with different economic status discussed in table 2. Level of ALT, ALT and albumin are higher in infected hosts with poor, middle and rich socio-economic status, while level of bilirubin and urea are significantly low.

Current study concluded that there is a direct relation between the parasitic prevalence and age of women. There is a noticeable relationship between parasitic infection and socio-economic status, and hygiene, lifestyle and climate. Increasing prevalence due to lack of education and awareness as well as living in countryside areas agrees with the current epidemiological results due to inferior socioeconomic position. There is a vital need to provide consciousness of toxoplasmosis among the community, particularly in relative to the means in which it is spreaded, so that female can protect and get aware of this parasitic infection.

Table .1 The prevalence of *T. gondii* in women visiting Bahawal Victoria Hospital (BVH), Bahawalpur.

Overall Prevalence					
Name of Parasite	Total No. of Hosts Observed	No. of Hosts Infected	Prevalence %	Chi-square(χ^2)	p-value
<i>T. gondii</i>	63	37	58.73	5.28	0.048
Age wise (years) prevalence					
16-25	16	8	50	1.26	0.152
26-33	19	12	63		
34-41	18	10	55.55		
≥42	10	7	70		
Disease wise Prevalence					
Hepatitis B	33	19	57.57	4.42	0.031
Kidney Problem	6	2	33.33		
Arthritis	6	3	50		
Diabetes	7	4	57.14		
Nausea	4	3	75		
Thyroid abnormality	7	6	85.71		

Number of child and Prevalence rate					
0-2	27	17	62.96	1.91	0.186
3-5	30	18	60		
6-8	6	2	33.33		
Host Economic Status and prevalence rate					
Poor	18	17	94.44	13.58	0.008
Middle	39	18	46.15		
Rich	6	2	33.33		

Table .2 The variations of biochemical parameters in women infected with *T. gondii* visiting Bahawal Victoria Hospital (BVH), Bahawalpur.

Characteristics	No. of Host	Bilirubin	ALT	AST	Urea	Albumin
16-25	IN (n=4)	21.75±1.42	17.43±4.29	29.60±6.23	5.90± 1.60	2.70±0.10
	NIN (n=4)	13.48± 2.32	9.07± 3.09	16.75± 6.98	5.64±1.05	2.83±0.23
26-33	IN (n=4)	18.26±1.48	44.9±11.9	39.67±4.86	6.95±1.08	4.85±0.55
	NIN (n=4)	16.01±3.18	8.26±2.17	13.49±2.69	5.85±1.25	5.65±1.15
34-41	IN (n=4)	15.95±1.94	30.05±3.81	40.45±8.54	5.32±0.79	4.95±3.70
	NIN (n=4)	17.225±0.96	10.87±2.70	27.46±5.84	4.75±1.39	6.00±0.50
≥42	IN (n=4)	14.98±1.37	31.38±7.94	52.66± 3.96	6.88±1.23	10.50±0.7
	NIN (n=3)	18.63±2.87	14.77±1.37	17.42±6.30	7.07±2.47	2.40±0.10
Disease wise variations in biochemical parameters						
Hepatitis	IN (n=8)	18.43±1.58	25.80±5.03	41.40±4.39	5.32±0.80	3.25±0.45
	NIN (n=7)	18.79± 1.37	11.14± 2.22	22.91± 4.03	6.43± 1.10	4.00±1.50
Kidney problem	IN (n=3)	16.17±2.48	35.2±15.0	35.9±15.2	6.03±2.03	6.20±3.60
	NIN (n=2)	12.76±3.40	8.70± 5.20	14.80±0.90	5.70± 0.40	4.70± 2.10
Arthritis	IN (n=3)	15.12±1.03	44.8±13.3	47.67±5.73	7.76±0.89	5.80± 0.40
	NIN (n=3)	16.37±2.92	11.04±3.08	14.53±8.46	3.87±1.72	2.80±0.50
Diabetes	IN (n=2)	21.13± 1.43	27.90± 8.70	34.85± 6.95	7.90±1.40	7.75±3.45
	NIN (n=3)	13.59± 3.10	11.40± 2.93	16.86± 5.08	6.17± 2.09	5.50± 1.00
No. of children wise variations in biochemical parameters						
1-2	IN (n=5)	18.04±2.34	43.0±14.0	38.93±7.14	6.83± 1.45	4.85±0.55
	NIN (n=3)	15.22± 3.45	8.54± 4.21	16.28± 5.55	7.60± 1.42	2.95±0.35
3-4	IN (n=7)	19.25±2.41	29.35±6.59	37.76±6.96	5.66±1.34	3.82±0.67
	NIN (n=9)	15.83±2.63	9.93±3.55	19.69±4.42	5.11±0.86	4.47±0.42
≥5	IN (n=4)	15.70± 2.01	37.8± 13.0	42.3± 13.7	6.10±2.08	10.5±0.70
	NIN (n=3)	18.63± 2.87	13.76± 0.86	23.2± 11.1	5.43± 1.91	2.40± 0.10
Host Economic Status wise variations in biochemical parameters						
Poor	IN (n=7)	17.58±1.45	23.00±2.72	38.28±5.60	6.32±1.04	7.45±3.75
	NIN (n=5)	21.20±3.10	12.80±2.40	18.30±2.60	6.00± 2.80	4.50±2.00
Middle	IN (n=6)	15.69±1.88	36.96±5.97	47.78±5.07	6.58±0.65	5.25±0.95
	NIN (n=6)	15.52±1.98	10.46± 2.51	17.72±3.07	5.65± 1.12	4.70± 2.10
Rich	IN (n=3)	15.08±1.78	66.30±3.50	51.5±14.8	5.85±3.65	7.60± 2.20
	NIN (n=4)	15.14±2.83	9.56±2.07	16.12±9.19	4.97±1.05	3.36±0.63

IN= Infected, NIN= Non-infected

REFERENCES

- Abamecha F, Awel H. Seroprevalence and risk factors of *Toxoplasma gondii* infection in pregnant women following antenatal care at Mizan Aman General Hospital, Bench Maji Zone (BMZ), Ethiopia. BMC infectious diseases. 2016 Dec;16(1):1-8.
- Al-Fartusie FS, Marzook AT, Morad TS. Study of some trace elements and antioxidant vitamins in sera of Iraqi women with toxoplasmosis. Al-Mustansiriyah Journal of Science. 2012; 23(3): 199-206.
- Al-Jowari SA, Hussein DK. Effect of toxoplasmosis infection on liver and kidney functions among pregnant women in Abo-Gharib district-Iraq. Iraqi Journal of Science. 2014;55(1):101-5.
- Bahia-Oliveira LM, Jones JL, Azevedo-Silva J, Alves CC, Oréface F, Addiss DG. Highly endemic,

- waterborne toxoplasmosis in north Rio de Janeiro state, Brazil. Emerging infectious diseases. 2003 Jan;9(1):55.
- Bamba S, Cissé M, Sangaré I, Zida A, Ouattara S, Guiguemdé RT. Seroprevalence and risk factors of *Toxoplasma gondii* infection in pregnant women from Bobo Dioulasso, Burkina Faso. BMC infectious diseases. 2017 Dec;17(1):1-6..
- Diza E, Frantzidou F, Souliou E, Arvanitidou M, Gioula G, Antoniadis A. Seroprevalence of *Toxoplasma gondii* in northern Greece during the last 20 years. Clinical microbiology and infection. 2005 Sep 1;11(9):719-23. Dubey, J. P. (2010). Toxoplasmosis of Animals and Humans (CRC, Boca Raton, FL). Parasites and Vectors. 112(3), 313-315.
- Dubey JP, Beattie CP. Toxoplasmosis of animals and man. CRC Press, Inc.; 1988.
- Dubey JP, Jones JL. *Toxoplasma gondii* infection in humans and animals in the United States. International journal for parasitology. 2008 Sep 1;38(11):1257-78.
- Faisal IA, Khan AU, Waqar M, Ahmad T, Shah T, Khan MI, Ali N, Faisal S, Saif I, Ahmad W, Javid U. Distribution of *Toxoplasma gondii* in the pregnant women of district Swabi Khyber Pakhtunkhwa Pakistan. World Appl Sci J. 2014;29(1):77-9.
- Farooq U, Samad HA, Sher F, Asim M, Khan MA. Continuing Education Article Cholistan and Cholistani Breed of Cattle. Pakistan Veterinary Journal. 2010;30(2):2074-7764.
- Fernandes GC, Azevedo RS, Amaku M, Yu AL, Massad E. Seroepidemiology of *Toxoplasma* infection in a metropolitan region of Brazil. Epidemiology & Infection. 2009 Dec;137(12):1809-15.
- Frimpong C, Makasa M, Sitali L, Michelo C. Seroprevalence and determinants of toxoplasmosis in pregnant women attending antenatal clinic at the university teaching hospital, Lusaka, Zambia. BMC infectious diseases. 2017 Dec;17(1):1-8.
- Gebremedhin EZ, Abebe AH, Tessema TS, Tullu KD, Medhin G, Vitale M, Di Marco V, Cox E, Dorny P. Seroepidemiology of *Toxoplasma gondii* infection in women of child-bearing age in central Ethiopia. BMC Infectious Diseases. 2013 Dec;13(1):1-9.
- Hashim yahay Al-Mahana W. Study of some biochemical marker in abortion women infected with Toxoplasmosis. Al-Qadisiyah Journal of Pure Science. 2017;22(2):152-8.
- Hokeleck M, Kiling M, Erturt M, Yyar Y. Production of *Toxoplasma gondii* in human amnion cell cultures. Turt. Parasite. Derg. 2001;25(4):323-5.
- Jadoon, A. Akhtar T., and Maqbool A. Seroepidemiology of *Toxoplasma gondii* in Women. Biologia Pakistan, 2011 57(12), 41-46.
- Jassam FS. Relationship between toxoplasmosis and testosterone hormone among schizophrenic patients in Baghdad (Doctoral dissertation, Dissertation, College Council of Health and Medical Technology. Baghdad, Iraq).
- Jg M. LieSenfeld o. 2004: Toxoplasmosis. Lancet.;363(9425):1965-76.
- Jones JL, Kruszon-Moran D, Sanders-Lewis K, Wilson M. *Toxoplasma gondii* infection in the United States, 1999–2004, decline from the prior decade. The American journal of tropical medicine and hygiene. 2007 Sep 1;77(3):405-10.
- Kieffer F, Wallon M. Congenital toxoplasmosis. Handbook of clinical neurology. 2013 Jan 1;112:1099-101.
- Lashari MH, Afzal F, Farooq U. Hematological Changes in Free-Range Chicken (*Gallus domesticus*) Naturally Infected with *Toxoplasma gondii*. Sarhad Journal of Agriculture. 2018 Dec 1;34(4):973-8.
- Lopes AP, Dubey JP, Moutinho O, Gargaté MJ, Vilares A, Rodrigues M, Cardoso L. Seroepidemiology of *Toxoplasma gondii* infection in women from the North of Portugal in their childbearing years. Epidemiology & Infection. 2012 May;140(5):872-7.
- Nijem KI, Al Amleh S. Seroprevalence and associated risk factors of toxoplasmosis in pregnant women in Hebron district, Palestine. EMHJ-Eastern Mediterranean Health Journal, 15 (5), 1278-1284, 2009. 2009.
- Olivier A, Herbert B, Sava B, Pierre C, John DC, Aline. Surveillance and monitoring of *Toxoplasma* in humans, food and animals: A scientific opinion of the panel on biological hazards. EFSA J., 2007; 583: 1-64.
- Sharif M, Gholami SH, Ziaei H, Daryani A, Laktarashi B, Ziapour SP, Rafiei A, Vahedi M. Seroprevalence of *Toxoplasma gondii* in cattle, sheep and goats slaughtered for food in Mazandaran province, Iran, during 2005. The Veterinary Journal. 2007 1;174(2):422-4.
- Smith JL. Foodborne toxoplasmosis. Journal of food safety. 1991 Apr;12(1):17-57.
- Tasawar Z, Raza AA, Aziz F, Lashari MH. Prevalence of human toxoplasmosis in district Muzaffargarh, Punjab, Pakistan. Gomal J. Med. Sci. 2012 10(1):
- Zemene E, Yewhalaw D, Abera S, Belay T, Samuel A, Zeynudin A. Seroprevalence of *Toxoplasma gondii* and associated risk factors among pregnant women in Jimma town, Southwestern Ethiopia. BMC Infectious Diseases. 2012 Dec;12(1):1-6.