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**Muhammad Taimur Khan**  
Department of Zoology,  
Government Post Graduate  
College, Charsadda, Pakistan

**Jalal Ud Din**  
Department of Biotechnology,  
Faculty of Chemical and Life  
Sciences, Abdul Wali Khan  
University Mardan (AWKUM),  
Mardan, Pakistan

**Sajid Ali**  
Department of Biotechnology,  
Faculty of Chemical and Life  
Sciences, Abdul Wali Khan  
University Mardan (AWKUM),  
Mardan, Pakistan

**Abid kamal**  
Department of Zoology,  
Government Post Graduate  
College Charsadda, Pakistan

**Arab Hussain**  
Department of Zoology,  
Government Post Graduate  
College Charsadda, Pakistan

**Ahmad Yar**  
Department of Zoology,  
Government Post Graduate  
College Charsadda, Pakistan

**Hira Bibi**  
Department of Biochemistry,  
Abdul Wali Khan University  
Mardan, Pakistan

**Hasnainjan**  
Department of Biotechnology  
Quaid-izam University  
Islamabad, Pakistan

**Shah Faisal**  
Department of Biotechnology  
Bacha Khan University  
Charsadda, KPK, Pakistan

**Correspondence**

**Shah Faisal**  
Department of Biotechnology  
Bacha Khan University  
Charsadda, KPK, Pakistan

## Seroprevalence of *Toxoplasma gondii* infection in cows and goats of district Charsadda, Khyber Pakhtunkhwa, Pakistan

**Muhammad Taimur Khan, Jalal Ud Din, Sajid Ali, Abid kamal, Arab Hussain, Ahmad Yar, Hira Bibi, Hasnainjan and Shah Faisal**

### Abstract

*Toxoplasma gondii* is a globally distributed protozoan parasite. This study was performed to find out the seroprevalence of *Toxoplasma gondii* in *Cows* and *Goats* in District Charsadda. A total of 288 samples 139 from *Cows* and 149 from *Goats* were xi collected and examined by latex agglutination test. Out of 139 cow 77(55.39%) were detected seropositive for Toxoplasmosis and out of 149 *Goats* 62(41.61%) were found seropositive. In *Cow*, a high seroprevalence rate of (80.00%) was obtained in age group of above 03 to 4 years while in *Goats*; the highest seroprevalence rate of (57.14%) was detected in age group\_Two to three year. In *Cow* the seroprevalence rate was higher in female (61.95% as compared to male (42.55%) In *Goats* the seroprevalence rate was higher in female (47.31%) as compared to male (32.14%). The present study shows that the prevalence in *Cow* and *Goats* is higher in District Charsadda, which is a risk factor for human infection. Therefore, proper control measure should be taken to avoid infection of Toxoplasmosis.

**Keywords:** toxoplasmosis, *Toxoplasma gondii* Seroprevalence, cows and goats

### 1. Introduction

*Toxoplasma gondii* is an intracellular protozoan parasite [1]. *Toxoplasma gondii* is globally distributed and a causative agent of toxoplasmosis [2]. Toxoplasmosis is a parasitic zoonotic disease that causes serious reproductive and economic losses all over the world [3]. It has been estimated that approximately one third of the world's population has been infected with *toxoplasma gondii* [4]. *Toxoplasma* is capable of infecting almost all the warm blooded animals in most part of the world and is estimated to infect 4 to 77% of humans [5]. It especially affects immunosuppressed individuals, causing serious damage to the central nervous system and also has a clinical impact on the unborn foetus [6]. Its infection is generally caused by ingesting the Oocyst stage, reaching to body tissues via water and food contacted by cat's faeces [7]. The condition is also passed via placenta from mother to offspring while feeding the child during pregnancy [8]. The other routes of *T. gondii* infection are vertical organ transplantation and blood transfusion [9]. As *toxoplasma gondii* is cosmopolitan in distribution [1]. For evaluating the comparative significance of wide causes of toxoplasmosis in humans, epidemiological survey still remains the main important approach. There have been a wide range of serological surveys conducted in different countries to determine the prevalence of toxoplasmosis in farm animals and humans; from north and *South America*, Europe, Africa and Asia [5, 10, 11, 12]. Diagnosis of toxoplasmosis can be aided by serologic or histocytologic examination, but serologic test are the usual means for establishing the diagnosis. Clinical signs of toxoplasmosis are nonspecific and cannot be depended on for a definite diagnosis. Toxoplasmosis clinically mimics several other infectious diseases [13]. Parasites enter gastrointestinal cells, after their release from cysts or oocysts, where they multiply, disrupt cells, and infect contiguous cells [14]. Organisms may spread first to the mesenteric lymph nodes and then to distant organs by invasion of lymphatics and blood stream. *T. gondii* infects all cell types, and cell invasion occurs as an active process. Then it generates the formation of a parasite- porous vacuole which does not fuse with intracellular organelles [14]. The aim of the current study was to determine the seroprevalence of toxoplasmosis infection in cows and goats in Charsadda, KPK Pakistan.

## 2. Material and Methods

### 2.1 Study area

Area of the study is conducted in district Charsadda. Charsadda is a town and headquarters of Charsadda District, in the Khyber Pakhtunkwa province of Pakistan

### 2.2 Sample size

A total of 288 samples, 139 samples of *Cows* and 149 samples of *Goats* were collected from different parts of district Charsadda and examined for seroprevalence of *T. gondii*

### 2.3 Collection of blood

3-5 ml of blood was collected from jugular vein by using 5 ml of clean syringe. Blood was then centrifuge at 3500 rpm and for 10 minutes to collect the serum.

### 2.4 Test procedure

The test procedure was performed according to standard protocol and manufacturer of the company *Toxo latex*

agglutination test is performed using “*toxol* latex kit” of “Spin react” company “Spain”. After obtaining serum, 20 micro litre serum is added to the glass slide, and then 20 micro litre of *toxol* latex reagent is added to the slide and mix with the help of stirrer for three minutes. After mixing it is studied for positive and negative.

## 3. Results

### 3.1 Overall prevalence of *Toxoplasma gondii* in *Cows* and *Goats*

A total of 288 animals including *Goats* and *Cows* from different localities (Tehsil Charsadda, Tehsil Tangi, Tehsil shabqadar) of District Charsadda, Pakistan were examined for the presence of *T. gondii* antibodies. Out of 288 animals 77 (55.39%) were detected positive for *T. gondii* in *Cows* and 62(41.61%) were detected in *Goats*. A high percentage of infection was found in *Cows* as compared to *Goats* which is show in (Table 1).

**Table 1:** Overall prevalence of *toxoplasma gondii* in *Cows* and *Goats*

Animals	Total no of samples	Positive samples	Negative sample	Positive %
<i>Cows</i>	139	77	62	55.39%
<i>Goats</i>	149	62	87	41.61%

### 3.2 Prevalence of *Toxoplasma gondii* in *Cows* and *Goats* of the three Tehsils

As this study was conducted in different Tehsils of district Charsadda (Tehsil Charsadda, Tehsil Tangi and Tehsil shabqadar). A total of 58, 45 and 36 samples of *Cows* is collected from Tehsil Charsadda, Tehsil Tangi and Tehsil

shabqadar in which 31(53.44%), 30(66.66%) and 16(44.44%) were seropositive respectively. A total of 65, 61 and 23 samples of *Goats* is collected from the three Tehsils of district Charsadda in which 30 (46.15%), 20 (32.78%) and 12 (52.17%) were seropositive in Tehsil Charsadda, Tangi and shabqadar respectively which is show in (Table 2, 3).

**Table 2:** Prevalence of *T. gondii* in *Cows* of the three Tehsils

Tehsil	Total sample	Positive sample	Negative samples	Negative samples
Tehsil Charsadda	58	31	27	53.44%
Tehsil Tangi	45	30	14	66.66%
Tehsil shabqadar	36	16	20	44.44%
Total samples	139	77	62	41.61%

**Table 3:** Prevalence of *T. gondii* in *Goats* of the three Tehsils

Tehsil	Total sample	Positive sample	Negative samples	positive %
Tehsil Charsadda	65	30	35	46.15%
Tehsil Tangi	61	20	41	32.78%
Tehsil shabqadar	23	12	11	52.17%
Total samples	149	62	87	41.61%

### 3.3 Sex wise prevalence of *Toxoplasma gondii* of *Cows* and *Goats*

Out of 47 male *Cows*, 20 (42.55%) were detected seropositive. In 92 examined female *Cows*, 57 (61.95%) were detected seropositive for *T. gondii* infection. Out of 56 examined male *Goats* 18 (32.14%) were detected seropositive for *T. gondii* antibodies while 44 (47.31%) out of 93 female *Goats* were detected seropositive for *T. gondii* antibodies.

High seroprevalence of toxoplasmosis was seen in female *Cows* as compared to male *Cows*. A significant difference was found in the male of *Cows* and *Goats*. Similar results were observed for male and female of *Cows* and *Goats*. Although the percentage of infection in female *Goats* was higher (47.31%) as compared to male *Goats* (32.14%) which is show in (Table 4, 5).

**Table 4:** Sex wise prevalence of Toxoplasmosis of *Cows* of the three Tehsils

Tehsil	Total sample			Female sample		Male sample		Positive %	
	+ive	-ive	total	+ive	-ive	-ive	total	Male	female
Tehsil Charsadda	58	23	17	40	8	10	18	44.44%	57.5%
Tehsil Tangi	45	25	7	32	5	8	13	38.46%	78.12%
Tehsil shabqadar	36	9	11	20	7	9	16	43.75%	45.00%
Total	139	57	35	92	20	27	47	42.55%	61.95%

**Table 5:** Sex wise prevalence of Toxoplasmosis of *Goats* of the three Tehsils

Tehsil	Total sample	Female sample		total	Male sample		total	Positive %	
		+ive	-ive		+ive	-ive		Male	female
Tehsil Charsadda	65	22	18	40	8	17	25	32.00%	55.22%
Tehsil Tangi	61	13	24	37	7	17	24	29.16%	35.13%
Tehsil shabqadar	239	9	7	16	3	4	7	42.85%	56.25%
Total	149	44	49	93	38	56	56	32.14%	47.31%

### 3.4 Age wise prevalence of *Toxoplasma gondii* of *Cows*

*Toxoplasma gondii* infection was also examined in different age groups of *Cows*. Out of 14 examined *Cows* whose age was up to one year 5 (35.71%) were detected positive while 10 (52.63%) *Cows* were infected in age group of 1 to 2 year in 19 examined samples. In age group of 2 to 3 year 18 (52.94%)

were seropositive in 34 examined samples. A high seroprevalence 24 (80.00%) was found in age group of 3 to 4 year in 30 examined samples. In age group of 4 to 5 years 13 (52.00%) were seropositive in 25 examined samples, while 7 (41.17%) were seropositive in age group of above 5 years in 17 examined samples which is show in (Table 6).

**Table 6:** Age wise prevalence of toxoplasmosis among *Cows*

Age	total sample	positive sample	negative sample	positive %
Up to one year	14	5	9	53.71%
One to two year	19	10	9	52.63%
Two to three year	34	18	16	52.94%
Three to four year	30	24	6	80.00%
Four to five year	25	13	12	52.00%
Above five year	17	7	10	41.17%
Total	139	77	62	55.39%

### 3.5 Age wise prevalence of *Toxoplasma gondii* of *Goats*.

The prevalence also varied in different age groups of *Goats* ranging from 30.00% to 57.14%. Out of 33 examined *Goats* 10 (30.30%) were seropositive in age group of upto 1 year. The *T. gondii* infection was found in 9 (25.71%) out of 35

samples in age group of 1 to 2 year. A high prevalence 24 (57.14%) was found in age group of 2 to 3 year out of 42 examined *Goats*. Out of 39 examined *Goats* 19 (48.71%) were seropositive in age group of above three years which is show in (Table 7).

**Table 7:** Age wise prevalence of toxoplasmosis among *Goats*

Age	Total sample	Positive sample	Negative sample	Positive %
Up to one year	33	10	23	30.30%
One to two year	33	9	26	25.71%
Two to three year	42	24	18	57.14%
Above three year	39	19	20	48.71%
Total	149	62	87	41.61%

## 4. Discussion

The present study was conducted in order to know the seroprevalence of *toxoplasma gondii* infection. A total of 139 samples of *Cows* and 149 samples of *Goats* were collected and the result found were 55.39% and 41.61% respectively. Various studies carried out in other countries and other parts of Pakistan; have reported different contamination rates for *T. gondii* in *Cows* and *Goats*. This may be due to difference in time and season of sampling and also differences of sensitivities and specificities of assays used. *T. gondii* infection is widely distributed at a worldwide scale, with incidences from zero to 100% in the different countries [15]. The sero-prevalence rate of *T. gondii* was reported 17% in Norway, 24% in Ethiopia 25.1% and 28.9% in Brazil [16, 17]. 31% in Mexico, 52% in Pakistan, 59.8% in Bulgaria, 66% in Czech Republic, and 67.9% in Zimbabwe [18, 19]. Prevalence of *T. gondii* infection of 41.61% found in sera of *Goats* in present study is higher than 35.5% from Malaysia [20]. Greece 30.7 %, Brazil 30.6 % [21]. Mexico 31 %, Thailand 27.9 %, Pakistan 14.32%, Egypt 28.7%, Bangladesh 32%, China 10%, China 14.1%, but is lower than that reported from Romania 52.8 %, Pakistan 53.84 %, Zimbabwe 67.9 %, Bangladesh 61.0 %, Pakistan 52 %, Stara Zagora Region 59,8 %, but the results reported in Pakistan 42.28%, 42.8 % and West Indies 42.8 % *Goats* were reported from West Indies is

nearly same to the result of the present study [27]. A high prevalence of *T. gondii* infection was observed in females as compared to male *Goats* which are similar to the previously conducted studies [22, 23]. In *Cows* the prevalence of *T. gondii* is greater in females as compared to male *Cows* as reported in South East Iran [24]. It is not possible to compare prevalence data of studies because of the use of different serological tests with variable specificity and sensitivity. Warm and humid environmental conditions are favourable for the spread of toxoplasmosis [5]. Prevalence of *toxoplasma gondii* infection during this study in *Cows* is 55.39% which is higher than Egypt 23.6 %, Sudan 32 %, sudan 44.8 %, New Caledonia 33 %, Southern China 5.7 %, Bangladesh 12 %, China 11 %, Bangladesh 27 %, Iran 1.6 %, Assam 26.66 %, Pakistan 19.75 %, Pakistan 20%, Algaria 3.92 %, Brazil 1.03 %, Somalia 7.1 %, But is lower than Iran 71.3 %, Brazil 83.40 % [25, 26]. The differences in the results of toxoplasmosis is due to various reasons, some factors depend on the climatic conditions, temperature, humidity and hygienic conditions hygienic condition is the major factor in the spread of *toxoplasmosis*. It is not possible to compare prevalence data of studies because of the use of different serological tests with variable specificity and sensitivity. Warm and humid environmental conditions are favorable for the spread of *toxoplasmosis*. *Toxoplasma gondii* infection is high in regions

where the people eat undercooked meat, unwashed vegetables and fruits and the people who have contact with cats and *dogs* or other domestic animals or have direct contact with the soil. Toxoplasmosis is more common in those areas where people drink municipal water.

## 5. Conclusion

The aim of the present study is to know the seroprevalence of *Toxoplasma gondii* in district Charsadda Pakistan. This study demonstrated that toxoplasmosis is prevalent in both the sexes (male and female) and all age groups of *Cows* and *Goats* in District Charsadda, Pakistan. The percentage of toxoplasmosis is greater in *Cows* as compared to *Goats*. In *Cows* the percentage of toxoplasmosis is 55.39% in 139 examined *Cows* and 41.61% in 149 examined *Goats*. In *Cows* the prevalence is 53.44%, 66.66% and 44.44% in Tehsil Charsadda, Tehsil Tangi, and Tehsil shabqadar respectively. In *Goats* the prevalence recorded is 46.15%, 32.78% and 52.17% in in Tehsil Charsadda, Tehsil Tangi, and Tehsil shabqadar respectively. In *Cows* the percentage is high in female's cows (61.95%) as compared to male (42.55%). In *Goats* the percentage is also greater in females (47.31%) than males (32.14%). In *Cows* the percentage is greater in age group of three to four year (80.00%) in 30 examined *Cows*. In goats the percentage is greater in age group of two to three year (57.14%) in 42 examined *Goats*. The results found in this study demonstrate that the prevalence rate is higher in female's *Goats* as compared to male *Goats*. It means that older and female *Goats* possess low immunity to *toxoplasmosis*. This study also demonstrates that infected *Cows* and *Goats* may be a potential risk for human *toxoplasmosis*. Therefore, proper measures should be taken to control and prevent toxoplasmosis in *Goats* and *sheep* in the region.

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