

**Research Article**

Prevalence of *Toxoplasma Gondii* in Domestic Breeds of Goats in Faisalabad, Punjab

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Abstract: Toxoplasmosis is a zoonotic disease caused by a protozoan parasite *Toxoplasma gondii*. The goal of this study was to look into *Toxoplasma (T.) gondii* prevalence in goats. Toxoplasmosis was examined in n= 380 goats of both sexes, male n=80 and female n=300, aged 1-6 years, from Faisalabad district, Punjab province. A total of n = 202 goats out of n = 380 were seropositive, resulting in a 53.15% overall prevalence. The latex agglutination test was used to look for *T. gondii* antibodies in the obtained sera. This test was evaluated in animals as a toxoplasmosis screening serologic test. *T. gondii* was found to be more common in female goats 60% than in male goats 27.5% with statistical significance $P<0.05$. The prevalence of toxoplasmosis was highest 58.46% in Teddy goats and lowest 45.83% in Beetal goats, with statistical significance ($P<0.05$) in the association between different goat breeds and *T. gondii*. Toxoplasmosis had the highest prevalence 70.42% in the 5-6 years age group and the lowest prevalence 37.27% in the 1-2 years age group, indicating statistical significance ($P<0.05$). The parasite had the highest prevalence 65.60% in the body weight group of 51-60 kg and the lowest prevalence 32.25% in the body weight group of 20-30 kg with statistical significance ($P<0.05$) in the body weight group. The differences were considered statistically significant at $P\leq 0.05$.

Keywords: Prevalence, *Toxoplasma Gondii*, Goat, Age, Sex, Breed, Latex Agglutination Test (LAT), Faisalabad

1. Introduction

Toxoplasmosis is a zoonotic disease caused by *Toxoplasma gondii*, a protozoan parasite. Both veterinary and human medicine can benefit from it [1]. Infection not only causes major reproductive losses in sheep and goats, but it also has public health implications since infected meat and milk can facilitate zoonotic transmission [3]. Fetal mortality rates

(including caprine abortion and neonatal mortality owing to *T. gondii*) in infected flocks can reach 50%, with minimal losses in non-clinical cases [5]. Goats are an economically important animal in many nations, they are the most important source of meat and milk [4]. In Islamic nations, where unpasteurized goat milk is used according to cultural norms, infected goats are a major source of *Toxoplasma* infection [2]. *T. gondii* has become more common in several nations, including Pakistan, due to a

lack of modern farming. Meat can easily be infected with *T. gondii* oocysts in the surrounding area after being transported from slaughterhouses [6]. Because stray cats are commonly seen around open-air markets in Pakistani culture, they constitute a potential source of disease transmission [2]. Due to cultural traditions, unpasteurized goat milk is often drunk. As a result of these characteristics, there is an increased risk of infection after consuming these meals. Prevalence studies on many animal species have been undertaken in various parts of the world [7, 9-12]. In different sections of Punjab, Pakistan, there are significantly fewer reports on the prevalence of toxoplasmosis in sheep and goats [8, 13]. *T. gondii* infection in Faisalabad goats, on the other hand, is still controversial. As a result, this study was carried out to learn more about the incidence of *T. gondii* and its correlations with age.

2. Materials and Method

2.1. Collection of Blood from Animals

Toxoplasmosis was examined in n= 380 goats of both sexes, male n=80 and female n=300, aged 1-6 years, from Faisalabad district, Punjab province. Beetle n=120, Teddy n=130, and Nachi n=130 were the three breeds represented. Each animal's jugular vein was punctured and a blood sample 5ml was taken. Serum was collected by centrifugation at 4000 rpm for 10 minutes after clotting and kept at -200 C until further examination.

2.2. Serological Tests

The latex agglutination test was used to look for *T. gondii* antibodies in the obtained sera. This test was evaluated in animals as a toxoplasmosis screening serologic test [14].

2.3. Latex Agglutination Test

The test technique was carried out according to the method given by manufacture. The commercial "Toxoplasmosis Latex Kit" (Antec Diagnostic Product TM Uk) was utilised for this purpose. Briefly, fifty microliters of 1:8 diluted sera was combined with the (LAT) buffer. A favourable result was demonstrated via agglutination. Sera were serially 2- fold diluted i.e. 1:16, 1:32 and 1:64.

2.4. Statistical Analysis

Statistical analysis of frequencies of the number of positive animals of different breeds, age and sex were performed using chi-square test. The differences were considered statistically significant at $P \leq 0.05$.

3. Results and Discussion

A total of n=202 goats' blood sera were found to be positive out of n=380 (53.15%). Various incidence rates ranging from 0% to 100% have been documented in various parts of the world [21], based on local customs, traditions, residents' lifestyles, weather conditions, animal age, and husbandry

practices. [15, 16] showed a 51% frequency in Saudi Arabian goats, which is almost identical to the current study's findings. The prevalence rate in this study is higher than that reported by several authors in goats from various parts of the world: 28.9% in Brazil [19], 27.9% in Satun Province, Thailand [22], 25.4% in Pakistan [20], and 19.88% in sheep from southern Punjab, Pakistan [25]. On the other hand, the current study's prevalence rate is lower than the 67.9% infection rate identified in Zimbabwe [21] and 59.4% in Giza, Egypt [18]. All of these investigations indicated different prevalence rates, which might be explained by host age, breed, sex, environmental circumstances, farm size, number of cats, and management strategies [14, 16]. In the current investigation, n=22 of the n=80 male hosts tested positive for toxoplasmosis, indicating a 27.5% prevalence of the disease. Female hosts had a substantially greater prevalence of 60% $P < 0.05$ than male hosts (Table 1).

Table 1. Prevalence of toxoplasmosis in goats in term of sex.

Sex	No of Animals Tested	Positive Tested	Positive (%)
Male	80	22	27.5%
Female	300	180	60%
Total	380	202	53.15%

Female animals are more susceptible to protozoan parasites than male animals, according [3, 4]. Males were found to be less positive than females in this investigation. The current findings are consistent with past research [10, 11]. Anti-*T. gondii* antibodies were found in Ghanaian sheep and goats [15]. It was assessed the prevalence of toxoplasmosis in goats in southern and central Ethiopia, as well as risk variables [20]. Anti-*T. gondii* antibodies were shown to be more common in females than in males. The hormonal differences between males and females play a significant effect in parasite infection susceptibility [24]. Many hormones, particularly sex-associated hormones, are now commonly considered to have a direct impact on the immune system [17]. Although it has been documented that oestrogen boosts antibody production while androgen suppresses both T-cell and B-cell immune responses [8], female immunity can be harmed by a variety of factors such as nutrition, age, pregnancy, and the environment. The fact that there were more female goats investigated than male goats may have contributed to the higher frequency of *T. gondii* in this study. Teddy had (76/130) 58.46% toxoplasmosis, Beetal had (55/120) 45.83% toxoplasmosis, and Nachi had (71/130) 54.61% toxoplasmosis (Table 2).

Table 2. Prevalence of toxoplasmosis in goats in term of breed.

Breed	No of Animals Tested	Positive Tested	Positive (%)
Beetal	120	55	45.83%
Teddy	130	76	58.46%
Nachi	130	71	54.61%
Total	380	202	53.15%

The difference between the two groups was not significant ($P > 0.05$). However, the Teddy goats appeared to have a greater infection rate than the Beetal and Nachi goats [6] reported similar findings. Toxoplasmosis is more common in

certain breeds of animals than in others. The causes for the disparities in prevalence could be attributable to genetic variation and infection resistance in various breeds [4, 6]. The body weight group 51-60kg had the highest prevalence of toxoplasmosis at 65.60%, whereas the body weight group 20-30 kg had the lowest prevalence at 32.25% (Table 3).

Table 3. Prevalence of toxoplasmosis in goats in term of body weight.

Body Weight (kg)	Positive (%)
20-30	32.25%
31-40	45.36%
41-50	52.20%
51-60	65.60%

The prevalence of toxoplasmosis is directly proportional to the animal's body weight; as the animal's body weight grows, so does the prevalence. Similar findings have been reported by others [2]. In sheep, [5] found a usually higher prevalence of toxoplasmosis in the lower body weight group, contrary to the current findings. The higher parasite incidence in the bigger body weight group could be attributed to a lack of parasitic infection resistance. The parasite had the maximum incidence of 70.42% in the age group of 5-6 years and the lowest prevalence of 37.27% in the age group of 1-2 years (Table 4), according to the relationship between age and toxoplasmosis in goats.

Table 4. Prevalence of toxoplasmosis in goats in term of Age.

Age (years)	Positive (%)
1-2	37.27%
2-3	41.76%
4-5	54.20%
5-6	70.42%

As the animal's age climbed, so did the predominance. As previously observed, the progressive growth of *T. gondii* with age shows a continuing exposure to the organism in the environment [8]. According to [12], prevalence rose with goat age, with 3.7% of 54 six-month-old goats seropositive (more than or equal to 1:40) compared to 17.8% of 218 one-year-old goats [12, 13]. Antibodies to toxoplasmosis were tested in 631 goat serum samples was used commercial latex agglutination test kits to investigate the prevalence of antibodies to *T. gondii* in farm goats in Thailand's Satun Province. Positivity was higher in older goats than in younger goats under the age of one year [23]. Anti-*T. gondii* antibody was found in much larger numbers in older goats than in children. The current study's findings are consistent with those reported by others [22]. This could be explained by the fact that older animals have lower immunity to toxoplasmosis [18].

4. Conclusions

Toxoplasmosis is frequent in both sexes (male and female) and all age groups of goats in Faisalabad, according to this study. Toxoplasmosis is more common in females and older goats, according to the current study. Positive toxoplasmosis was more common in goats beyond the age of 5-6 years than in younger goats. It means that toxoplasmosis immunity is low in older and female goats. Infected goats may provide a danger

of human toxoplasmosis, according to this study. As a result, suitable measures should be adopted in the region to manage and prevent toxoplasmosis in goats.

Conflicts of Interest

The authors declare no conflict of interest for this research work.

References

- [1] Alexander J and WH Stinson, (1988). Sex hormones and the course of parasitic infection. *Parasitology Today*, 4: 189-193.
- [2] Arko-Mensah J, KM Bosompem, EA Canacoo, JM Wastling and BD Akanmori, (2000). The seroprevalence of toxoplasmosis in pigs in Ghana. *Acta Tropica*, 76: 27-31.
- [3] Barakat AMA, MM AbdElaziz and M Fadaly, (2009). Comparative diagnosis of toxoplasmosis in Egyptian small ruminants by indirect hemagglutination assay and elisa. *Global Veterinaria*, 3: 9-14.
- [4] Berger-Schoch AE, D Bernet, MG Doherr, B Gottstein and CF Frey, (2011). *Toxoplasma gondii* in Switzerland: A serosurvey based on meat juice analysis of slaughtered pigs, wild boar, sheep and cattle. *Zoonoses and Public Health*, doi: 10.1111/j.1863-2378.2011.01395.
- [5] Bisson A, S Maley, CM Rubaire-Akiiki, JM Watling, (2000). The seroprevalence of antibodies to *Toxoplasma gondii* in domestic goats in Uganda. *Acta Tropica*, 76: 33-38.
- [6] Clementino MM, MF Souza, and VF Andrade Neto, (2007). Seroprevalence and *Toxoplasma gondii*-IgG avidity in sheep from Lajes, Brazil. *Veterinary Parasitology*, 146: 199-203.
- [7] Da Silva JAP, (1999). Sex hormones and glucocorticoids: Interactions with the immune system. *Annals of the New York Academy of Science*, 876: 102-118.
- [8] Dubey JP and DS Adams, (1990). Prevalence of *Toxoplasma gondii* antibodies in dairy goats from 1982 to 1984. *Journal of the American Veterinary Medical Association*, 196: 295-301.
- [9] Ghazaei C, (2006). Serological survey of antibodies to *Toxoplasma gondii*. *African Journal of Health Sciences*, 13: 131-134.
- [10] Hill DE, S Chirukandoth and JP Dubey, (2005). Biology and epidemiology of *Toxoplasma gondii* in man and animals. *Animal Health Research Reviews*, 6: 41-61.
- [11] Hove T, P Lind and S Mukaratirwa, (2005). Seroprevalence of *Toxoplasma gondii* infection in goats and sheep in Zimbabwe. *Onderstepoort Journal of Veterinary Research*, 72: 267-72.
- [12] Ivana L, DD Olgica, KK Sofija, N Aleksandra, (2006). Cross sectional survey of *Toxoplasma gondii* infection in cattle, sheep and pigs in Serbia: seroprevalence and risk factors. *Veterinary Parasitology*, 135: 121-131.
- [13] Jittapalapong S, A Sangvaranond, N Pinyopanuwat, W Chimnoi, W Khachaeram, S Koizumi and S Maruyama, (2005). Seroprevalence of *Toxoplasma gondii* infection in domestic goats in Satun Province, Thailand. *Veterinary Parasitology*, 127: 17-22.

- [14] Lashari MH and Z Tasawar, (2010). Seroprevalence of toxoplasmosis in sheep in Southern Punjab, Pakistan. *Pakistan Veterinary Journal*, 30: 91-94.
- [15] Neto JOA, SS Azevedo, SM Gennari, MR Funada, HFJ Pena, ARCP Araujo, CSA Batista, MLCR Silva, AAB Gomes, RM Piatti and CJ Alves, (2008). Prevalence and risk factors for anti-Toxoplasma gondii antibodies in goats of the Serido Oriental micro region, Rio Grande do Norte state, Northeast region of Brazil. *Veterinary Parasitology*, 156: 329-332.
- [16] Olivier A, B Herbert, B Sava, C Pierre, DC John, DK Aline, (2007). Surveillance and monitoring of Toxoplasma in humans, food and animals: a scientific opinion of the panel on biological hazards. *The European Food Safety Association Journal*, 583: 1-64.
- [17] Radostits OM, DC Blood and CC Gay, (1994). A textbook of the disease of cattle, sheep, pigs, goats and horses. 8th ed. W. B. Saunders, London, UK.
- [18] Ramzan M, M Akhtar, F Muhammad, I Hussain, E Hiszczynska-Sawicka, AU Haq, MS Mahmood and MA Hafeez, (2009). Seroprevalence of Toxoplasma gondii in sheep and goats in Rahim Yar Khan (Punjab), Pakistan. *Tropical Animal Health and Production*, 41: 1225-1229.
- [19] Roberts CW, W Walker and J Alexander, (2001). Sex-Associated Hormones and Immunity to Protozoan Parasites. *Clinical Microbiology Reviews*, 14: 476-488.
- [20] Sanad MM and AJ Al-Ghabban, (2007). Serological survey on toxoplasmosis among slaughtered sheep and goats in Tabouk, Saudi Arabia. *Journal of the Egyptian Society of Parasitology*, 37: 329-340.
- [21] Sharif M, Sh Gholami, H Ziaei, A Daryani, B Laktarashi, SP Ziapour, A Rafiei and M Vahedi, (2006). Seroprevalence of Toxoplasma gondii in cattle, sheep and goats slaughtered for food in Manzadaran Province, Iran. *Journal of Animal and Veterinary Advances*, 5: 188-190.
- [22] Spisak F, L Turcekova, K Reiterova, S Spilovska and P Dubinsky, (2010). Prevalence estimation and genotypization of Toxoplasma gondii in goats. *Biologica* 65: 670-674.
- [23] Teshale S, A Dumetre, ML Darde, B Merga, and P Dorchie, (2007). Serological survey of caprine toxoplasmosis in Ethiopia: prevalence and risk factors. *Parasitology*, 14: 155-159.
- [24] Tsubota N, K Hiraoka, Y Sawada, T Watanabe, S Ohshima, (1977). Studies on latex agglutination test for toxoplasmosis. *Japanese Journal of Parasitology*, 26: 286- 290.
- [25] Van der Puije WNA, KM Bosompem, EA Canacoo, JM Wastling and BD Akanmori, (2000). The prevalence of anti-Toxoplasma gondii antibodies in Ghanaian sheep and goats. *Acta Tropica*, 76: 21-26.