

Original article

The Role of Cats in the Transmission of *Toxoplasma gondii* in Urban and Rural Areas of Gharyan, Libya

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Abstract

The zoonotic protozoan parasite is quite widespread around the globe. The human species is part of a group of warm-blooded animals that can serve as a host for the protozoan parasite. The domestic cat is the definitive host of the protozoan parasite. Domestic cats are significant in the transmission of the protozoan parasite due to the very resistant oocysts they discharge in their feces. The objective of this research was to determine how domestic cats transmit *Toxoplasma gondii* in both rural and urban regions of Gharyan, Libya. Fecal samples from domestic and stray cats in some regions of Gharyan city were obtained using a cross-sectional method. The results of the parasitological tests for detecting *T. gondii* oocysts in 120 cat fecal samples showed that *T. gondii* was present in 28 (23.3%) of the samples. This implies that *T. gondii* transmission may be facilitated by a large number of domestic cats. Secondly, the results revealed that the parasite had a higher prevalence in the rural area (30.0%) than in the urban area (16.7%). Thirdly, the results revealed that the parasite had a higher prevalence in stray cats (27.1%) than in domestic cats (18.0%). The environmental factors that are involved in the transmission of the parasite include the presence of animal life, exposure to soil, and poor waste disposal. This illustrates the role that cats play in the transmission of the *T. gondii* parasite and the need to control stray cats and maintain a clean environment in the prevention of the transmission of toxoplasmosis in Libya.

Keywords: *Toxoplasma Gondii*, Cats, Toxoplasmosis, Urban, Rural, Environmental Contamination.

Introduction

The protozoan parasite *Toxoplasma gondii* is universally distributed. It causes toxoplasmosis, a zoonotic disease that infects several warm-blooded animals, including humans. The main hosts that shed oocysts resistant to the environment are the members of the family Felidae, which include the domestic cat. The life cycle of the parasite is extremely complex. The environment gets contaminated by the oocysts shed by the host. These oocysts can then infect humans, animals, and other intermediary hosts. Thus, cats are important hosts for the epidemiology of toxoplasmosis. The chances for the oocysts of *T. gondii* getting into the environment are quite high when there is an enormous population of domestic and stray cats, along with poor sanitary practices. The human population is infected with the virus mainly through the consumption of infected food and water, as well as undercooked infected meat, and accidentally ingesting the oocysts in the environment. However, in cases of immunocompromised people and pregnant women, there are severe problems such as congenital toxoplasmosis and fetal anomalies [1].

Because of its worldwide distribution and its effect on human health and cattle production, toxoplasmosis has been recognized as a public health problem in many regions of the world in recent decades. Various research carried out in different parts of the globe has shown varying levels of prevalence depending on environmental factors, human population density of cats, food habits of the people, and levels of sanitation. For instance, in the urban sector, high human population density, improper waste disposal, and high densities of stray cats may contribute to the high levels of environmental contamination. However, in the rural sector, close associations of humans with livestock and domestic animals may provide opportunities for the spread of the parasite through soil, water, and animal feed. These findings show the need for an understanding of the effects of environmental and ecological factors on the epidemiology of *T. gondii*. Despite the recognition of the international importance of toxoplasmosis, little is known regarding the epidemiological pattern of the parasite's transmission in many developing countries, particularly in North Africa [2].

Large populations of free-ranging domestic cats have been identified in rural and urban settings of Libya. There is concern over their possible role in the spread of the parasite. They pollute the environment and spread the disease since they are found in marketplaces, farms, residential areas, and food storage facilities. They are often found in and around homes and farms in rural settings due to their use as rodent controllers, which increases their interaction with sheep,

goats, and poultry. The human parasite can be contracted by consuming infected, raw, or undercooked meat of these animals, as they may act as intermediate hosts. However, the transmission of the parasite in different geographical locations could be affected by several environmental factors, i.e., the composition of the soil, the source of the water, and the climate. The presence of the parasite in the environment could be affected by the dry and semi-arid climate of Libya. However, data on the role of cats in the epidemiology of toxoplasmosis in Libyan communities are still limited [3].

The main problem that this study aims to address is the lack of understanding with regard to the role that cats play in the transmission of *T. gondii* infection in various environmental settings, especially in urban and rural ecosystems. Although several studies have been conducted in various countries across the globe to determine the prevalence of toxoplasmosis infection in human beings or animals, few studies have been conducted to determine the role that cats play in the transmission of *T. gondii* infection in Libyan ecosystems. Most of the studies conducted in the country focus on the seroprevalence of the infection in human beings or animals without adequately addressing the ecological and environmental routes along which the infection can be spread. Without adequate knowledge with regard to the transmission routes that are associated with the cat population, it may become difficult to control the infection effectively [4].

Another important issue is the presence of domestic as well as stray cats. Stray cats often move freely and have access to farms, marketplaces, and even the places where the waste is disposed of. Thus, the possibility of the stray cats getting the virus from the food they eat or the prey they kill is very high. There is a possibility that millions of oocysts may be shed into the general public if they get infected with the virus, especially in the early stages of the infection. There is more possibility of the spread of oocysts in rural areas, where many people are engaged in farming. Despite the many risks that may be associated with the presence of cats, studies that have compared the epidemiological role of cats in urban and rural settings in Libya are limited. As a consequence, this is a significant barrier to the understanding of the real epidemiology of toxoplasmosis and the modalities of the population's transmission.

The lack of studies on the dynamics of the transmission of the infection caused by *T. gondii* in urban and rural settings in Libya, particularly with regard to the role of cats as the definitive host, is the gap that this research is trying to cover. In fact, the majority of the research conducted in North Africa focused on the human seroprevalence or infection rates among domestic and wild animals, without focusing on the role of cats. Furthermore, there is a limited number of studies that have examined the role of various environmental, behavioral, and demographic factors that might impact the process of the transmission and spread of the dynamics of the *T. gondii* infection. This study examines the two environments and tries to find the differences between the two, which might impact the effectiveness of the control strategies to be implemented to effectively deal with the particular challenges of the two environments. As emphasized by [5], the effectiveness of the control measures used to address the transmission dynamics of *T. gondii* infection would vary across settings.

The innovation of the present research lies in its holistic approach to the investigation of the role of cats as a vector for the transmission of *T. gondii* in different ecosystems of Libya. While the previous studies were limited to the investigation of a particular host, the present research places greater emphasis on the comparative approach, taking into account the differences between the urban and rural ecosystems. Such a comparative approach to the investigation of the interactions between cats, humans, and animals, as well as the conditions of the environment, could lead to a more complete understanding of the epidemiology of toxoplasmosis. This will, in turn, lead to the determination of the major factors that cause pollution of the environment and the transmission of infections. Additionally, this current study will be helpful in adding to the limited research on toxoplasmosis infections in Libya and North Africa by providing new insights on the epidemiology of the infections within this region.

On the basis of the aforementioned factors, the present research aims to examine the role of cats as vectors of the *Toxoplasma gondii* parasite in the rural and urban areas of Libya. In this context, the research objectives include the examination of the distribution of the cat population and their possible role in the spread of the parasite into the environment, the identification of the possible difference between the risks of the spread of the parasite in urban and rural areas, and the identification of the possible factors that may affect the spread of the parasite. The research aims to contribute to the knowledge of the epidemiology of toxoplasmosis in Libya and to provide scientific data that may be used to design preventive and control measures.

Toxoplasma gondii is a protozoan parasite that is widely distributed all over the world. It is a zoonotic protozoan parasite because it can infect almost all warm-blooded animals, including humans. However, its definite host is a member of the family Felidae, specifically a domestic cat species known as *Felis catus*. Besides excreting a lot of oocysts in their feces that contaminate the environment, infected domestic cats also transmit a lot of resistant oocysts to the environment. After spending a lot of time in the environment, they then infect their intermediate hosts, such as humans, animals, birds, rodents, among others, as they ingest them. *Toxoplasma gondii* is a protozoan parasite belonging to the Coccidian class. This protozoan parasite is capable of completing both the sexual and asexual life cycles of a parasite within a single host [6].

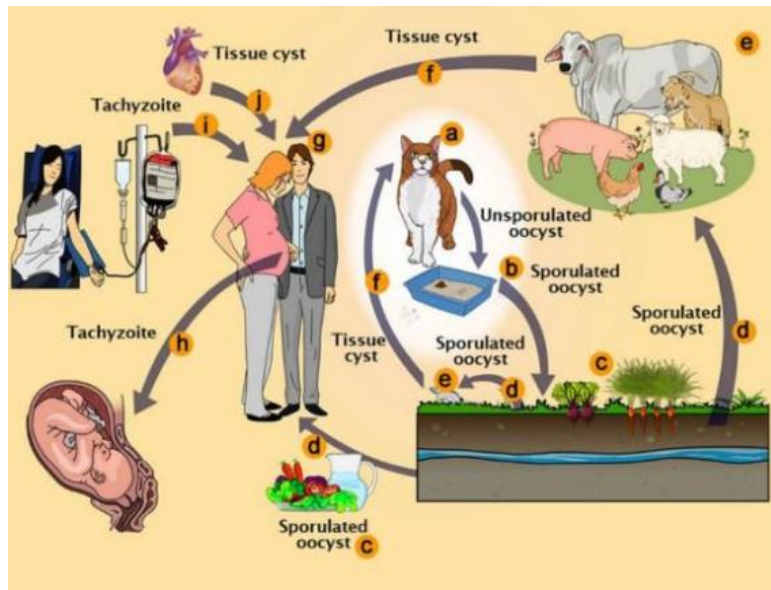


Figure 1. Transmission pathways of *Toxoplasma Gondii* [6].

Since the sporogony of the parasite does not occur in any other host, it is believed that the domestic cat is the definitive host for *T. gondii*. The stomach of the cat produces nonsporulated oocysts, and they are shed in the feces. Humans and other animals are infected by ingesting sporulated oocysts present in the soil. Birds and other animals are considered to be the intermediate hosts. For the human host, the parasite is in the asexual or schizogony stage. For the human host, particularly the immunocompromised individual (HIV/AIDS), spontaneous reactivation of the latent infection induced by *T. gondii*, where the bradyzoites transform into tachyzoites, is not common. However, the immune system acts to prevent the further spread of these tachyzoites [7].

However, the process of reactivation may occur uncontrolled and/or more often in immunocompromised patients, and the fascinating idea of the parasites being able to perceive the reduced ability of the host to fight them could lead to a severe and even fatal recrudescence. Although the life cycle of the parasite *T. gondii* is unknown in Libya, the country has a large population of small rodents, which could act as hosts for the final host of the *Toxoplasma* infection. Of particular interest was the presence of cats at home, as it showed a positive correlation with the seroprevalence rate of toxoplasmosis among pregnant women in Sebha and Tripoli City, respectively. The air conditions in the various cities of Libya, which are anticipated to boost the survival and spread of oocysts shed by the definitive host, are predicted to lead to a greater number of infected intermediate hosts. This region also has several herbivores, and this facilitates the multiplication of *T. gondii*.

Materials and Methods

Study design and sampling

The design used in this research is based on the cross-sectional comparative research design, with emphasis on the role of cats in the transmission of *Toxoplasma gondii* in both urban and rural Gharyan, Libya. Gharyan is located in the northwestern region of Libya, within the Jabal Nafusa (Nafusa Mountains), which constitute part of the broader Tripolitanian highlands. Geographically, the city lies at approximately 32.17° N latitude and 13.02° E longitude, with

an average elevation ranging between 700 and 800 meters above sea level. Situated roughly 80 kilometers south of Tripoli, Gharyan functions as a transitional zone between the northwestern coastal plains and the inland desert regions. The research setting includes urban regions and rural communities that offer different ecological and environmental conditions. The urban setting in Gharyan city includes dense human populations, high populations of stray cats, and market and human residential activities, while the rural setting in Gharyan city includes agricultural environments where livestock farming is common, and cats are often found in and around farms and households for rodent control. The target population includes both domestic and stray cats found in the research setting. The sampling method employed in the study is based on the purposive and convenience sampling approach, where samples are collected from accessible cats in the setting. Cat faeces were part of the biological samples that were used in the experiment, and they were chosen due to the fact that, during the infectious stage, they discharge *T. gondii* oocysts. There were a total of 120 samples of fecal matter, with 60 from rural and 60 from metropolitan areas. Furthermore, the samples were not only collected from homes, markets, farms, and trash disposal sites, but they were also collected from domestic as well as stray cats. Each sample was placed in a sterile container and then labeled accordingly. This ensured that, in order to compare the chances of environmental contamination as well as the transmission of *T. gondii*, there were an equal number of samples from both rural and metropolitan areas.

Data collection

Data collection involved both field sampling and laboratory examination. Fresh fecal samples were obtained using sterile gloves to prevent contamination. Each sample was assigned a unique identification code corresponding to the site of collection and other relevant information about the samples. The obtained samples were then kept in suitable conditions and transported to the laboratory for parasitological examination. At the laboratory level, the fecal samples were examined using standard parasitological procedures to identify the presence of *T. gondii* oocysts. Besides biological sampling, environmental observations were also conducted at all sampling sites. The observations included information about the number of cats in the area, the presence of livestock, sanitation conditions, and other potential sources of contamination, such as garbage areas, food storage locations, and water sources. All information was obtained using standardized data collection forms to ensure consistency and accuracy in data collection [8].

Data analysis

The data collected was then organized and analyzed using spreadsheet software. Descriptive statistical analysis was used to evaluate the findings from the laboratory examination and environmental observation. The prevalence of *T. gondii* oocysts found in the cat fecal samples was calculated and expressed as frequencies and percentages. A comparison of the findings from the urban and rural settings in Gharyan was conducted to identify any possible differences. In addition, environmental factors were examined to identify any that might affect the spread of the parasite. With this analysis, the research was able to evaluate the epidemiological role of cats as a reservoir in the life cycle of the parasite and their contribution to environmental contamination in the different ecosystems of Gharyan, Libya [9].

Results

In order to determine the presence of *Toxoplasma gondii* oocysts and the potential role of cats as a source of transmission of the parasite to humans, the current study examined the fecal samples of domestic and stray cats in urban and rural areas of Gharyan, Libya. Parasitological examination of 120 fecal samples revealed the presence of *T. gondii* oocysts, and the results indicated the presence of the oocysts in the fecal samples of the cats, which may highlight the role of cats as a source of transmission of toxoplasmosis to humans. The results of the current study are presented in the following tables:

Table 1. Detection of *Toxoplasma gondii* Oocysts in Cat Fecal Samples

Result	Number of Samples	Percentage (%)
Positive	28	23.3
Negative	92	76.7
Total	120	100

The total number of *Toxoplasma gondii* oocysts present in the cat fecal samples is shown in (Table 1). Among the 120 cat fecal samples, 28 (23.3%) samples showed positive results for the presence of *Toxoplasma gondii* oocysts, whereas 92 (76.7%) samples showed negative results. Almost a quarter of the sample population is actively engaged in the spread of toxoplasmosis in the environment, as inferred from the overall results of the presence of oocysts in the cat fecal samples. The overall detection of the oocysts in the cat fecal samples shows that the cats in the study areas are actively involved in the transmission of toxoplasmosis. Although the overall results show that the majority of the cat fecal samples tested negative, the overall percentage of the positive results is still significant in the epidemiology of the disease, as a single infected cat can shed millions of oocysts in the environment during the shedding period. Due to their high resistance and ability to remain in the soil or water for long periods of time, they increase the risks of infection in both human and animal lives. Therefore, the fact that oocysts of *T. gondii* have been identified in 23.3% of the samples indicates that the population under consideration may be infected with the parasite.

Table 2. Prevalence of *Toxoplasma gondii* Oocysts in Urban and Rural Areas in Gharyan City.

Area	Positive Samples	Negative Samples	Total	Prevalence (%)
Urban	10	50	60	16.7
Rural	18	42	60	30.0
Total	28	92	120	23.3

(Table 2) indicates the difference between the prevalence of *Toxoplasma gondii* oocysts between urban and rural areas. From the results, it is evident that the prevalence of the infection is higher in the rural area (30.0%) than in the urban area (16.7%). This implies that the environmental and ecological conditions of the rural area may favor the transmission of the *Toxoplasma gondii* parasite. This is because the conditions of the rural area, such as the presence of farming activities and the interaction between cats and animals, as well as the interaction between cats and the soil, may favor the transmission of the parasite. In addition, rural cats may have more opportunities to hunt infected intermediate host species such as rodents and birds, which could also contribute to the higher infection rates. In addition, although urban areas also presented positive cases, the lower rates could be related to environmental conditions, food sources, and management practices for these animals. All these findings emphasize the importance of geographic differences in the study of the epidemiology of toxoplasmosis.

Table 3. Detection of *Toxoplasma gondii* Based on Cat Type

Cat Type	Positive	Negative	Total	Prevalence (%)
Domestic Cats	9	41	50	18.0
Stray Cats	19	51	70	27.1
Total	28	92	120	23.3

Table 3 indicates the detection of *Toxoplasma gondii* based on the type of cats, where domestic cats are compared with stray cats. From the table, it is evident that stray cats have a higher rate of infection with *T. gondii* than domestic cats. Out of 70 samples of stray cats, 19 were found to be infected with *T. gondii*, while only 9 out of 50 samples of domestic cats were infected. This indicates that stray cats could be more effective in spreading *T. gondii* oocysts in the environment. Stray cats live in an uncontrolled environment where they scavenge for food. *Toxoplasma gondii* oocysts have been identified in rodents and birds, and stray cats could have ingested these infected food sources. Furthermore, it is established that stray cats move about freely in different places, including the market, farms, and residential areas. As a result, they contaminate the soil and water. Domestic cats, on the contrary, have limited access to the outdoors and

receive a controlled diet. As a consequence, the high prevalence among stray cats points to their possible role as a source of infection with *T. gondii* in the community.

Table 4 above shows the various environmental factors that could be implicated in the transmission of the parasite. In the rural environment, the level of presence of livestock and soil is high. These two factors could be implicated as the cause of the high level of transmission of the parasite. In the urban environment, the level of poor management of waste and the presence of stray cats in public places is high. The study showed that cats in the two environments could be implicated as the cause of the transmission of the parasite, but the level of transmission is high in the rural environment and among stray cats. The study showed that environmental factors could be implicated as the cause of the distribution of toxoplasmosis in Gharyan, Libya.

Table 4. Environmental Risk Factors Observed in Sampling Locations

Environmental Factor	Urban Areas (%)	Rural Areas (%)
Presence of Stray Cats	65	75
Livestock Presence	15	70
Poor Waste Management	55	40
Soil Exposure	35	80

Table 5 prevalence of *Toxoplasma gondii* oocysts based on the location of the samples. As shown in the table, the highest prevalence of the parasite is found in market areas at 32.0%, followed by farms at 27.5%, and then residential areas at 20.0%. On the other hand, the lowest prevalence is found in the waste disposal area at 10.0%. Therefore, the above table suggests that the spread of the parasite is facilitated by high human and animal activity, which is more characteristic of market and farm areas.

Table 5. Prevalence of *Toxoplasma gondii* Oocysts by Sampling Location

Sampling Location	Number of Samples	Positive Samples	Prevalence (%)
Residential Areas	35	7	20.0
Markets	25	8	32.0
Farms	40	11	27.5
Waste Disposal Areas	20	2	10.0
Total	120	28	23.3

Discussion

The current research aimed to identify the role of cats in the transmission of *T. gondii* in urban and rural areas of Gharyan city by studying the results of analyzing cat feces samples obtained from domestic and stray cats. The results revealed that a significant number of cats were shedding *T. gondii* oocysts, thus showing their potential role in contaminating the environment and in the transmission of toxoplasmosis. The overall prevalence rate of 23.3% in this research indicated that *T. gondii* exists in the cat population in these environments. Although not all cats were infected with *T. gondii*, the presence of oocysts in almost a quarter of the samples revealed a great public health concern because infected cats can shed a huge number of oocysts in the environment in the acute phase of infection. The oocysts are highly resistant to environmental conditions and can survive in soil and water for a long time, thus increasing the chances of acquiring infection in humans, animals, and livestock [10].

The presence of *T. gondii* in cat fecal samples indicates that cats play an essential role in the parasite's life cycle. When infected, cats are capable of shedding millions of oocysts that end up polluting their environment. These oocysts then infect intermediate hosts, such as birds, rodents, and livestock, which then become sources of infection for humans. In such communities, humans are likely to be infected through the consumption of infected food and water, ingestion of polluted soil, and consumption of raw meat from infected sources. The presence of oocysts in the feces of cats thus acts as significant evidence that the spread of toxoplasmosis in the environment could be occurring in the communities under study [11].

One of the significant findings of the study is the disparity in the prevalence rate between urban and rural settings of

Gharyan city. The study found that rural settings had a higher prevalence rate of *T. gondii* oocysts (30.0%) than urban settings (16.7%). The disparity in prevalence rates between urban and rural settings could be due to several ecological and behavioral factors that play an essential role in parasite transmission. Rural settings are characterized by close associations between humans, animals, and the environment, such as soil and water sources. Domestic cats in rural settings are often found in close association with farms and agricultural environments where they hunt and feed on intermediate hosts, such as rodents and birds, that could be infected with the parasite. The hunting of infected intermediate hosts could increase the chances of infected cats shedding the parasite in the environment. In addition, rural settings are often characterized by close associations between humans and the environment, such as soil, which could play an essential role in parasite transmission. *T. gondii* oocysts are known to be viable in the environment for several months, particularly in favorable environmental conditions [12].

In Gharyan City, the results of this study can also be explained if we take into account epidemiological data related to Libya. Previous studies have shown that toxoplasmosis is common in Libyan territories, including environmental factors, which play an important role in the epidemiology of this zoonotic infection. For example, [13] indicated a 11% prevalence rate of *Toxoplasma gondii* infection in domestic cats in Al-Marj City, which is significantly lower than that recorded in this study. This difference could be explained by ecological factors as well as the fact that this study included both stray and domestic cats. Another study conducted by [14] indicated that the high density of stray cats and rodents in Libyan cities and rural areas plays an important role in maintaining the life cycle of *T. gondii*. In Gharyan City, it is expected that there is a high interaction between cats, animals, and humans due to the urban-rural landscape of this region, which could influence environmental contamination with this zoonotic agent.

Additionally, human studies carried out in Libya also give credence to the public health implications of this research. For instance, the high levels of human seroprevalence rates, such as the 45.5% reported by [15] in the Sirte area, and more than 50% among women with abortion cases, as reported by [16] and [17], also shows a positive link with exposure and infection. This also correlates with the findings of this research that contaminated soils, water, and food – possibly as a result of cat feces – play a major role in the transmission of the infection. In Gharyan City, for instance, the communities may use unfiltered water and thus may be more exposed to and also have more exposure and contact with soils and animal droppings. Therefore, the presence of *T. gondii* oocysts in the feces of cats, as observed in this research, points out an important public health issue in Gharyan.

On the other hand, the lower prevalence rate in urban areas could be related to differences in the behavior, food sources, and environment of cats. Domestic cats in urban areas are fed commercial cat food and may have limited opportunities to hunt infected prey. This controlled food source could reduce the chances of acquiring an infection. However, the presence of stray cats in urban areas could be a potential source of infection, as they mainly scavenge or hunt to obtain food. The presence of garbage disposal, markets, and food storage in urban areas could attract stray cats, thus leading to environmental contamination. Although the prevalence rate in urban areas is lower than that in rural areas, the presence of infected cats in urban areas could be a potential source of public health risk due to the high human population [18]. Another significant outcome of the present study is the difference between the infection rates of stray and domestic cats. According to the results, the rate of *T. gondii* infection was significantly higher in stray cats (27.1%) than in domestic cats (18.0%). This outcome could be related to the ecological characteristics of stray cats. Stray cats usually live in uncontrolled conditions and obtain their food by hunting or scavenging. Therefore, they have a greater chance of consuming infected prey, e.g., rodents and birds, carrying tissue cysts of the parasite. Stray cats usually move freely over a range of locations, e.g., farms, markets, and living areas, and consequently have a greater chance of exposure to the parasite. Their movement enables the spread of oocysts over a wider geographic range, thereby increasing the risk of environmental contamination [19].

Domestic cats, on the other hand, are known to be under human care, which might limit their movement and feeding. Domestic cats are usually under the direct care of their owners. This minimizes their chances of encountering infected prey. Furthermore, domestic cats are usually provided with proper medical attention and feeding, which might limit the chances of infection. However, the occurrence of *T. gondii* infection in domestic cats shows that these cats might be involved in the transmission process if they are provided with access to the outdoors or if they are fed undercooked meat [20]. Environmental factors have also been found to play a crucial role in the transmission of the parasite. From the observations recorded in the course of the study, various factors were noted to have the potential to influence the

transmission of the parasite. This includes the presence of livestock and exposure to soil, which could influence the transmission of the parasite. Livestock, such as sheep, goats, and poultry, have the potential to act as intermediate hosts for the parasite. When these animals eat contaminated soil, they could become infected and develop cysts. When humans eat meat from these animals, they could become infected. Livestock farms also attract cats, which hunt rodents or other small animals around the storage areas of the animal feeds, thus facilitating the transmission of the parasite [21].

In urban settings, the management of waste and the presence of stray cats were identified as significant factors that may affect the level of environmental contamination. In the garbage disposal area and the food market, stray cats may be found as they look for food wastes. These places may be contaminated with cat feces that contain oocysts of *T. gondii*. As these places are frequently visited by humans, the possibility of the transmission of oocysts is present. Thus, the management of waste is one of the essential practices that may reduce the risk of the transmission of toxoplasmosis [22]. The analysis of the sampling locations further emphasized the differences with regard to environmental risk factors. The locations with the highest prevalence of *T. gondii* infection were the market locations (32.0%), followed by farms (27.5%) and residential locations (20.0%). These locations are usually characterized by high human and animal activities, which may be a favorable environment for parasite transmission. Market locations are usually characterized by waste disposal, which may be a breeding ground for stray animals such as cats and rodents. Farm locations are usually characterized by a conducive environment for both intermediate and definitive hosts, which enables the parasite to complete its life cycle. Conversely, waste disposal locations had the least prevalence (10.0%), which may be attributed to the fact that the environmental conditions are not always favorable for the parasite to survive. Cats may not defecate in these locations [23].

Conclusion

The results of the present study underscore the role of cats as a significant factor for the spread of the parasite to the environment. The results of the present study showed a higher prevalence of the parasite in the rural population and stray cats. This indicates the importance of the environment and the role of cats in the epidemiology of the parasite. These results underscore the importance of considering the perspectives of both human and animal health for the effective control of the transmission of toxoplasmosis. This includes the control of the population of stray cats, proper waste disposal, and the promotion of responsible pet ownership and proper food handling. Furthermore, future studies could also focus on other epidemiological aspects of *T. gondii* infections in Libya, such as serological studies of human and animal populations, the molecular characterization of the strains of the parasite, and the assessment of environmental contamination by the parasite in the soil and the water. This would lead to a better understanding of the epidemiology of the transmission of toxoplasmosis and would enable the implementation of effective control and preventive measures. This could lead to the control of the impact of the parasite, as a zoonotic agent, on human and animal populations.

Conflict of interest. Nil

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