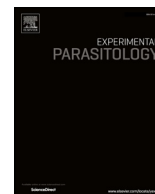




ELSEVIER

Contents lists available at ScienceDirect

## Experimental Parasitology

journal homepage: [www.elsevier.com/locate/yexpr](http://www.elsevier.com/locate/yexpr)

# The potential risk of toxoplasmosis for traffic accidents: A systematic review and meta-analysis



Shaban Gohardehi<sup>a,b</sup>, Mehdi Sharif<sup>c</sup>, Shahabeddin Sarvi<sup>a,c</sup>, Mahmood Moosazadeh<sup>d</sup>,  
Reza Alizadeh-Navaei<sup>e</sup>, Seyed Abdollah Hosseini<sup>a,c</sup>, Afsaneh Amouei<sup>a,c</sup>, Abdolsattar Pagheh<sup>a,c</sup>,  
Mitra Sadeghi<sup>a,c</sup>, Ahmad Daryani<sup>a,c,\*</sup>

<sup>a</sup> Toxoplasmosis Research Center (TRC), Mazandaran University of Medical Sciences, Sari, Iran

<sup>b</sup> Student Research Committee, Mazandaran University of Medical Sciences, Sari, Iran

<sup>c</sup> Department of Parasitology and Mycology, School of Medicine, Sari, Iran

<sup>d</sup> Health Sciences Research Center, Addiction Institute, Mazandaran University of Medical Sciences, Sari, Iran

<sup>e</sup> Gastrointestinal Cancer Research Center, Mazandaran University of Medical Sciences, Sari, Iran

## ARTICLE INFO

## Keywords:

Toxoplasmosis

*Toxoplasma gondii*

Traffic accidents

Systematic review

Meta-analysis

## ABSTRACT

Toxoplasmosis is a prevalent infectious disease. Although most people infected by *Toxoplasma gondii* are asymptomatic, evidence has suggested that this disease might affect some aspects of a host's behavior and associate with schizophrenia, suicide attempt, changes in various aspects of personality, and poor neurocognitive performance. These associations may play roles in increasing the risk of a number of incidents, such as traffic accidents, among infected people. In this regard, this study aimed to provide summary estimates for the available data on the potential risk of toxoplasmosis for traffic accidents. To this end, using a number of search terms, i.e. *toxoplasmosis*, *Toxoplasma gondii*, *traffic accident*, *road accident*, *car accident*, *crash*, and *prevalence*, literature searches (up to October 1, 2017) were carried out via 6 databases. The meta-analysis was conducted using the StatsDirect statistical software and a P-value less than 0.05 was regarded as significant in all statistical analyses. Out of 1841 identified studies, 9 studies were finally considered eligible for carrying out this systematic review. Reviewing results of these studies indicated that 5 out of 9 studies reported a significant relationship between *Toxoplasma gondii* and traffic accidents. Additionally, data related to gender showed significant differences between infected and control men and women. Considering age, reviewing the results of these studies revealed a significant difference between the infected people and the *Toxoplasma*-negative subjects under 45 years of age. However, no significant difference was found between the two groups aged 45 or older. Given these results, it can be concluded that *Toxoplasma gondii* significantly increases the risk of having traffic accidents.

## 1. Introduction

Toxoplasmosis is an infectious disease caused by an intracellular parasitic protozoan called *Toxoplasma gondii* (hereinafter referred to as *T. gondii*) (Robert-Gangneux and Dardé, 2012). This infection is generally acquired by ingesting cysts in raw or poorly cooked meat or eating fruits and vegetables contaminated with oocysts excreted from infected cat feces (Robert-Gangneux and Dardé, 2012). It can also be transmitted congenitally from a mother to her fetus, by blood transfusion, and by organ transplantation (Dard et al., 2016).

This infection is the most prevalent parasitic infection throughout the world that infects 30%–60% of the world's population (Kocazeybek et al., 2009; Samojlowicz et al., 2013). Its prevalence varies according to region and differences in climate, diet, hygiene, and host

susceptibility (Dard et al., 2016) and ranges from 6.7% in Korea to 68.6% in Brazil (Ahmadpour et al., 2014). A recent study carried out on the Iranian general population reported that 39.3% of individuals under study were seropositive (Daryani et al., 2014).

Toxoplasmosis can cause a variety of life-threatening clinical signs in cases of congenital infection or in immunocompromised patients (including HIV-infected, cancer, and transplantation patients) (Ahmadpour et al., 2014). Although several studies have indicated that this infection is usually asymptomatic in immunocompetent patients, others have revealed that the latent phase of *T. gondii*, when the cysts are formed, can lead to a number of changes in infected individuals (Dard et al., 2016; Flegr et al., 2002). Studies conducted on humans and mice have reported that, during this latent phase, the parasite mainly stays in neural or muscular tissues and leads to prolonged reaction

\* Corresponding author. 18th km of Khazarabad Road, P.O. Box: 48175-1665, Sari, Mazandaran, Iran.  
E-mail address: [daryani@yahoo.com](mailto:daryani@yahoo.com) (A. Daryani).

times, impaired motor performance, and changes in personality profiles (Flegr et al., 1996, 2000; Havlíček et al., 2001). Examining changes caused by this infection demonstrated that these changes are due to either the manipulative activities of *T. gondii* or some of the pathogenic activities of the parasite in the brain (Flegr et al., 2002). The changes in reaction times, motor performance, and personality profiles could increase the risk of several incidents, such as traffic accidents, among infected people.

A number of studies have been conducted to investigate the incidence of traffic accidents among infected drivers; however, to our knowledge, no studies have been carried out to gather and systematically analyze the obtained results. In this regard, the present study aimed to provide summary estimates for the available data on the potential risk of toxoplasmosis for traffic accidents. This study was performed to evaluate whether *T. gondii* seropositivity could associate with the risk of traffic accidents or not.

## 2. Methods

### 2.1. Search strategy and data extraction

In the present study, literature searches (up to October 1, 2017) were carried out via Google Scholar, MEDLINE by PubMed, Scopus, Science Direct, Web of Science (ISI), and Cochrane Library. Search terms applied alone or in combination were *toxoplasmosis*, *T. gondii*, *traffic accident*, *road accident*, *car accident*, *crash*, and *prevalence*.

To collect more accurate data, all published studies, including abstracts and full-texts, were comprehensively searched. Moreover, all references mentioned in relevant original and review articles were checked to avoid missing any additional eligible studies. This is while, due to a lack of access to dissertations and conference papers, they were not considered in the current study. Data were collected from studies in the English language.

To eliminate duplicate articles and identify studies that met the eligibility criteria of this study, a protocol was defined for the authors to assess all studies independently by evaluating their titles, abstracts, and full-texts. Any disagreements among the authors were resolved by discussion. The following data were extracted from each study: names of the authors, year of the study, study location, total sample size (number of cases and controls), and participants' demographic information (age and gender). Fig. 1 represents a flow diagram of the study design process.

### 2.2. Quality assessment

By applying the STROBE checklist, qualities of the selected studies were evaluated. This scale includes 22 items which evaluate statements that should be mentioned in reports of observational studies in one way or another. To examine such items, the selected studies' titles, abstracts, introductions, methods, results, and discussions were examined. In this meta-analysis, scores under 7.75 were considered as a low quality, scores between 7.76 and 15.5 were regarded as a moderate quality, scores between 15.6 and 23.5 were regarded as a moderate to high quality, and scores higher than 23.6 were considered as a high quality (Von Elm et al., 2007).

### 2.3. Statistical analysis

To examine the association between toxoplasmosis and traffic accidents, an odds ratio (OR) and a respective 95% confidence interval (CI) were calculated for each included study. A forest plot was used to visualize heterogeneity among the included studies. The size of every square indicated the weight of every study. Moreover, crossed lines illustrated CI. To assess heterogeneity and inconsistency, Cochran's Q and  $I^2$  statistics were applied. Additionally, small study effects and their publication bias were discerned by a bias assessment plot on the

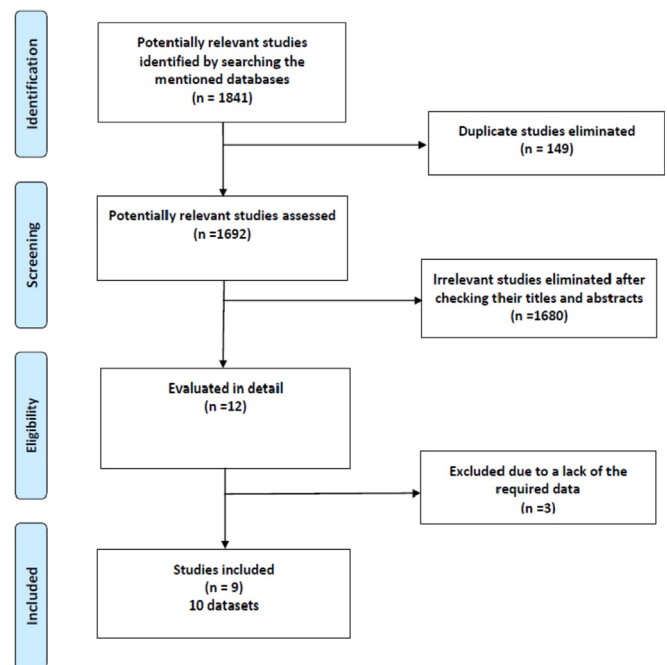


Fig. 1. The flow diagram of the study design process.

cornerstone of Egger's regression test. The StatsDirect statistical software (<http://www.statsdirect.com>) was used for analysis. The protocol for the current study was registered as PROSPERO CRD42017071261 (Daryani et al., 2017).

## 3. Results

In the present study, out of the 1841 identified studies, 9 studies were finally considered eligible for carrying out this systematic review. Among these 9 studies, a study carried out by Flegr et al. (2009) had two datasets. In this regard, 9 studies and 10 datasets were reviewed. Extracted data are presented in Table 1.

The mean score obtained from the STROBE scale was 17.33. This score indicated that the quality of the selected studies was moderate to high. Additionally, the mean scores obtained from the STROBE scale for the studies that found positive and negative associations were 18 and 16.5, respectively.

The selected studies were conducted in the Czech Republic, Turkey, Poland, Mexico, Russia, Iran, and Jordan. A total of 6514 people took part in these studies. Among them, 1102 people were cases and 5412 people were controls. In most of the included studies, the numbers of cases and controls were almost identical; however, in the studies carried out by Flegr et al. (2002) and Shotar et al. (2016), the numbers of cases and controls were quite different. In the former study, all soldiers in Prague were considered. Among these soldiers, 111 people who had traffic accidents were cases and the rest, 3779 people, were controls. This is while, in the latter study, 13 people who were arrested for being involved in traffic accidents were regarded as cases and 200 people were considered as controls. The data extracted from the mentioned studies, mostly related to cases and controls, are represented in Table 2.

Among these 9 studies, 5 studies reported a significant relationship between *T. gondii* and traffic accidents. However, 4 of these studies did not find any significant relationships between these two variables. In all these studies, IgG antibodies were measured by applying serological methods (ELISA was applied in 8 of these studies; however, IF was used in the study conducted by Samořłowicz et al. (2013)). Furthermore, in the studies carried out by Yerehi et al. (2006), Stepanova et al. (2017), Khademvatan et al. (2014), and Shotar et al. (2016), in addition to assessing IgG antibodies, IgM antibodies were also measured.

Download English Version:

<https://daneshyari.com/en/article/8844568>

Download Persian Version:

<https://daneshyari.com/article/8844568>

[Daneshyari.com](https://daneshyari.com)