

REVIEW ARTICLE

An Overview of Studies on the Prevalence of Neonatal Toxoplasmosis in Iran

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ABSTRACT

Background: Toxoplasmosis is a disease infecting humans and animals on a worldwide scale. The global prevalence of acute toxoplasmosis in pregnant women is between 0.1% and 0.8%. Acute toxoplasmosis can cause abortion and congenital disorders in the fetus. Few studies were conducted on the prevalence of neonatal toxoplasmosis in Iran. The purpose of this study was to determine the general status of this disease in Iranian neonates.

Materials and Methods: In this systematic review, PubMed, Google scholar, Science Direct, Scopus, MEDLINE, Med Lib, Scientific Information Database (SID), IranMedex, IranDoc, and Magiran were searched to find published reports on prevalence of the disease among neonates during 1980 to 2014.

Results: A total of 233 articles were retrieved. After excluding the unrelated and duplicate articles, only nine articles remained. These studies were undertaken only in northern and central regions of Iran. There was no data on congenital toxoplasmosis in other parts of Iran. In the reviewed studies, 3442 neonatal samples (including blood, cord blood, and amniotic fluid) were screened for toxoplasmosis.

Conclusion: Based on the estimated population of newborns in Iran, further studies on newborns in different parts of Iran should be conducted.

Key Words: Neonatal, Prevalence, Toxoplasmosis

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INTRODUCTION

Toxoplasmosis is a disease transmitted to humans and a wide range of warm-blooded animals around the globe. The disease is caused by an intracellular parasite, *Toxoplasma gondii* [1]. Although the disease is often asymptomatic, it can induce severe complications such as abortion, intrauterine death, and neurological disorders in newborns [2].

The seroprevalence of toxoplasmosis was reported to range between 10% and 90% in different countries, and the prevalence of acute toxoplasmosis in pregnant women is between 0.1% and 0.8% [3, 4]. Acute toxoplasmosis is the main cause of congenital toxoplasmosis (CT).

According to official statistics, the global annual incidence of CT was estimated to be 190,100 cases. Besides, annual incidence of CT in southeast Asia was 6430-25400 cases [3]. However, in other parts of Asia, including Iran, reliable data about CT are not available.

Based on the results of a recent meta-analysis, seroprevalence of toxoplasmosis among the general population in Iran was 39.3%. Therefore, more than one third of Iran's population is infected with the parasite [5]. Nonetheless, few studies were conducted on the prevalence of neonatal toxoplasmosis in Iran.

Herein, we sought to overview all the studies conducted on neonatal toxoplasmosis in Iran.

MATERIALS AND METHODS

Search strategy

For this systematic review, the English and Persian articles and dissertations published on neonatal toxoplasmosis in Iran from 1980 to 2014 and indexed in PubMed, Google scholar, Science Direct, Scopus, MEDLINE, Med Lib, Scientific Information Database (SID), IranMedex, IranDoc, and Magiran were collected. The

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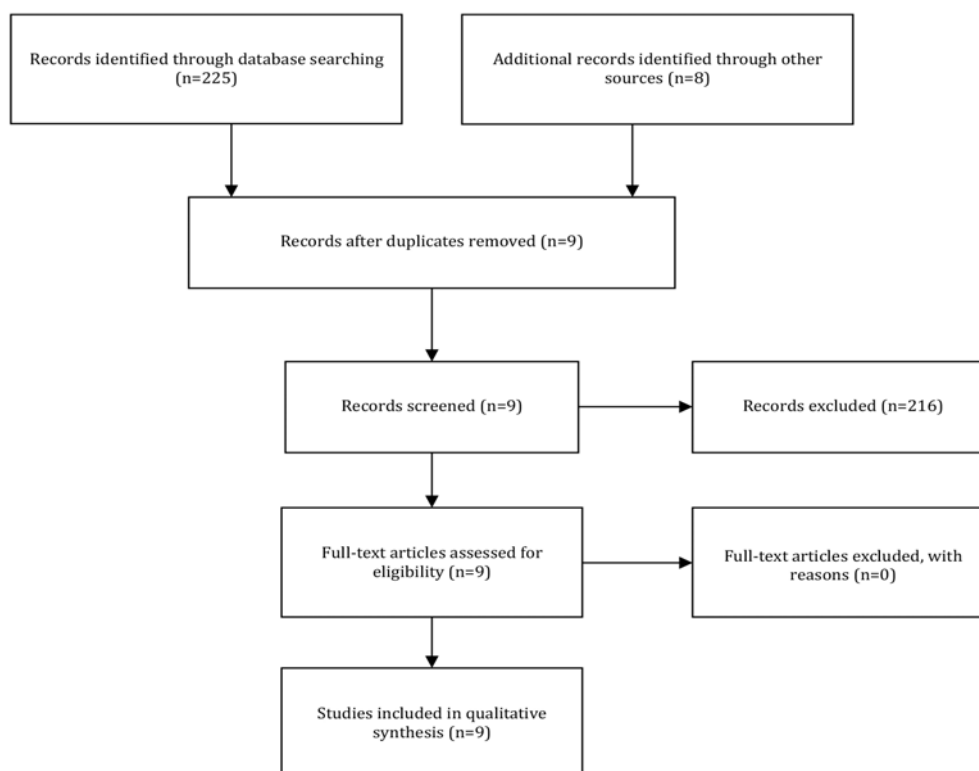


Figure 1. Flowchart describing the study design process

keyword combinations were “Toxoplasmosis in newborns”, “congenital toxoplasmosis”, “neonatal toxoplasmosis”, “newborn toxoplasmosis”, “infant toxoplasmosis”, “hereditary toxoplasmosis”, “neonatal screening for toxoplasmosis”, “epidemiology of toxoplasmosis in newborns”, “prevalence of toxoplasmosis in Iran”, “nervous system toxoplasmosis in human fetuses”, “neurological deficits”, “Iran”, and “Islamic Republic of Iran”. Figure 1 illustrates the PRISMA chart of the study.

Eligibility criteria

The inclusion criteria considered for this study were full papers and dissertations related to neonatal toxoplasmosis published in Iran from 1980 to 2014.

Data items and collection

The studies conducted to determine the prevalence of toxoplasmosis in aborted fetuses were also collected. The criteria for diagnosis of toxoplasmosis were serological or molecular methods.

Study selection

The selected papers were carefully reviewed and the information including first author, year of publication, type of study, study setting, language, subjects, sample size, diagnostic test, number of positive cases, type of antibody, seroprevalence, and signs of disease in positive

cases was extracted.

Synthesis of results

Considering that type of study and diagnosis of toxoplasmosis in the selected papers was not identical, performing a meta-analysis was not feasible.

RESULTS

Study selection

After searching the databases, 233 articles were retrieved. After excluding the unrelated and duplicate ones, nine studies on prevalence of neonatal toxoplasmosis in Iran remained. The PRISMA flowchart of systematic review is presented in Figure 1.

Study characteristics

Of the nine selected articles, two were cohort studies, one was case-control, and the rest were cross-sectional studies. Three studies were performed in Esfahan [6], Kashan [7], and Gorgan [8] and the rest in Tehran [9-14]. In these studies, 670 neonates, 2761 cord blood samples, 11 amniotic fluid samples, and 1061 pregnant women (toxoplasmosis suspected) were tested. In four studies, in addition to the serological methods, molecular methods were employed to detect or confirm toxoplasmosis. In one of the studies, only molecular methods were used for diagnosis (Table 1).

Table 1. Summarized details of the included studies

First author, year, language	Design (type of study)	City	Subjects (sample population)	Sample size	Diagnostic test	Anti-Toxoplasma antibody	Positive case	Seroprevalence %	The signs in positive cases	Explanations
Noorbakhsh et al. 2012, English [8]	Case-control	Tehran	infant < 1 years	50	ELISA	IgM	5 ^a	10%	Not mentioned	
Noorbakhsh et al. 2012, English [9]	Cohort study	Tehran	Neonate	270	Serologic: ELISA Molecular: PCR*	IgM	ELISA 4 ^a and PCR 0	1.5%	1) A 38 gestational weeks newborn girl with brain and eye defects 2) A 37 gestational weeks newborn girl with jaundice and eye defects 3) A 37 gestational weeks newborn boy with brain defects 4) A 38 gestational weeks newborn boy with generalized skin rashes	
Alameh et al. 2002, Persian [5]	Cross sectional	Isfahan	Neonate	18	IFA**	IgM and IgG	7 ^a	39%	One newborn with microcephaly and hypotony, the others had no signs	Newborn blood samples did not have IgM anti-Toxoplasma, but titer of IgG anti-Toxoplasma was 1/100 and 1/1600 indicating congenital toxoplasmosis.
Rasti et al. 2011, Persian [6]	Prospective cohort study	Kashan	Pregnant women and neonates whose mothers had IgM of anti-Toxoplasma	mothers 798 and neonate 4	Mothers: ELISA Neonates: ELISA and PCR	IgM	Mothers 5 ^b Neonate: 0 (by IgM) 3 ^a (by PCR)	Mothers 0.6 %	Only one newborn with CT had hyperbilirubinemia	Mothers from the 27th week of pregnancy until delivery were studied. Only newborns whose titer of IgG anti-Toxoplasma in their mothers was 1/400 or IgM anti-Toxoplasma was 1/100 or more were included in the study. Meanwhile, one of the mothers with acute toxoplasmosis after delivery did not agree to participate, who was excluded from the study.
Shaddel et al. 2007, English [10]	Cross sectional	Tehran	Neonate	104	Serologic: ELISA and IFA Molecular: PCR on CSF***	IgM	ELISA 6 IFA 5 PCR 6 Totally 7 ^a	5.77% 4.81% 5.77% Totally 6.73%	-	
Gharavi et al. 2002, Persian [11]	Cross sectional	Tehran	Cord blood	2761	IgM/ISAGA		8 ^a	-	-	
Assmar et al. 2004, English [12]	Cross sectional	Tehran	Pregnant woman with preceding IgG anti-toxoplasma and Fetus (amniotic fluid from cases that turned positive for IgM or showed a rising IgG titer)	200 pregnant women with suspected toxoplasmosis is 11 amniotic fluid	Serologic: rising IgG and IgM Molecular: PCR	IgM Rising IgG	IgM 4 ^b Rising IgG 11 ^b PCR 4 ^a	28.6% - -	- - -	
Golalipur et al. 2009, English [7]	Cross sectional	Gorgan	Neonate born with major congenital malformations and their mothers	Neonate: 64 Mother: 63	ELISA	IgM	Neonate: 2 ^a Mother: 3 ^b	Neonate: 3.2% Mother: 4.8%	In this study, the prevalence of antibody against TORCH syndrome agents was investigated, one of which is toxoplasmosis. Neonate: Neural tube defect and limb anomaly Mother: Neural tube defect	
Mehbod et al. 2005, Persian [13]	Cross sectional	Tehran	Neonate	106 and 104	ELISA and IFA	IgM	ELISA 6 ^a and IFA 2 ^a	5.66% and 1.92%		

¹ mother delivered twins, ^a positive cases in neonates, ^b positive cases in pregnant women with suspected toxoplasmosis, *Polymerase chain reaction, ** immunofluorescence assay, *** cerebrospinal fluid

Synthesis of results

A total of 48 samples from neonates and 23 samples from pregnant women had IgM anti-Toxoplasma antibodies, rising IgG antibody, or positive polymerase chain reaction results.

DISCUSSION

In the reviewed studies in this review, 3442 neonatal samples (including neonates' blood, cord blood, and amniotic fluid) were screened for toxoplasmosis. In comparison to the estimated population of newborns in Iran, the sample size was very limited.

The prevalence of toxoplasmosis varies among different parts of Iran. Various factors such as changes in climate and cultural practices in different regions of Iran can explain these discrepancies [15]. In two studies conducted in Isfahan and Kashan, Iran, 39% and 75% of newborns were infected with toxoplasmosis, respectively [6, 7]. It seems that the cause of high incidence of congenital toxoplasmosis in those studies was the selection of the samples, since they were performed on neonates whose mothers were infected with toxoplasmosis during pregnancy or the neonates born with congenital abnormalities. Thus, if the samples were selected from all newborns, the prevalence might be lower.

The sensitivity of diagnostic tests is important in detection of this disease. Review of the selected papers showed the serological (ELISA) and molecular tests for diagnosis of congenital toxoplasmosis are the best tests. It

must be noticed that neonatal health and mortality rate are important indicators of health status in a region, therefore, CT must be considered as a health hazard in newborns.

Limitations

In a review conducted by World Health Organization in 2013 on CT, Iran was not included because the related studies in Iran were scarce [3]. Furthermore, we found that all the studies carried out in Iran were set in the northern and central regions, which was one of the limitations of our review because such information was not available from most parts of the country and data was limited to specific areas. Thus, conducting a meta-analysis was not viable.

CONCLUSION

Regarding the estimated population of neonates in Iran, the sample size of the reviewed studies was very limited. Hence, for the proper evaluation of CT in Iran, further studies should be conducted in all parts of Iran. In other words, there are still plenty of opportunities to study this disease in newborns of Iran.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

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