Temporal evolution of Toxoplasmosis cases in pregnant women: an ecological study

Evolução temporal dos casos de Toxoplasmose em gestantes: um estudo ecológico

Evolución temporal de dos casos de toxoplasmosis en mujeres embarazadas: un estudio ecológico

Jéssica Kelly Alves Machado da Silva[1], Sandra Taveiros de Araújo[2], Amuzza Aylla Pereira dos Santos[3] Maria Elisângela Torres de Lima Sanches[4] Verônica de Medeiros Alves[5], Jayne Kelly Ferreira Porfírio [6],

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1. State University of Health Sciences of Alagoas. Maceió, Alagoas, Brazil. https://orcid.org/0000-0002-7576-8714

2- State University of Health Sciences of Alagoas. Maceió, Alagoas, Brazil. https://orcid.org/0000-0003-1286-1759

3- Federal University of Alagoas, Maceió, Alagoas, Brazil. https://orcid.org/0000-0001-6299-7190

4- Federal University of Alagoas, Maceió, Alagoas, Brazil. https://orcid.org/0000-0001-8987-3825

5- Federal University of Alagoas, Maceió, Alagoas, Brazil. https://orcid.org/0000-0002-4343-2941

6- Federal University of Health Sciences of Alagoas. Maceió, Alagoas, Brazil. https://orcid.org/0009-0004-7716-2902

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RESUMO

Objetivo: Objetiva-se descrever o perfil epidemiológico dos casos de toxoplasmose gestacional notificados em Alagoas no período de 2019 a 2023. **Métodos:** Trata-se de um estudo epidemiológico do tipo ecológico, descritivo e retrospectivo, de abordagem quantitativa, realizado a partir de dados coletados no Sistema de Informações de Saúde (TabNet), referente aos casos de Toxoplasmose Gestacional. Foram avaliados retrospectivamente os casos notificados entre 2019 e 2023. **Resultados:** Foi registrado o total de 898 casos notificados de toxoplasmose gestacional. A pesquisa mostrou que a evolução da doença, associada aos trimestres gestacionais, raça, faixa-etária e escolaridade refletem as condições socioeconômicas de determinada população. **Conclusão:** Além de demonstrar como o diagnóstico precoce favorece desfechos positivos. Entender a situação social da gestante e todos os fatores sociodemográficos que a cerca é imprescindível para contribuir efetivamente na diminuição de casos de toxoplasmose gestacional.

Descritores: Toxoplasmose; Cuidado pré-natal; Saúde da Mulher; Epidemiologia; Assistência integral à saúde.

ABSTRACT

Objectives: The objective is to describe the epidemiological profile of cases of gestational toxoplasmosis reported in Alagoas in the period from 2019 to 2023. **Methods:** This is an ecological, descriptive and retrospective epidemiological study, with a quantitative approach, carried out from data collected in the Health Information (TabNet), referring to cases of Gestational Toxoplasmosis. Cases reported between 2019 and 2023 were retrospectively evaluated. **Results:** A total of 898 reported cases of gestational toxoplasmosis were recorded. The research showed that the evolution of the disease, associated with gestational trimesters, race, age group and education reflect the socioeconomic conditions of a given population. **Conclusion:** In addition to demonstrating how early diagnosis favors positive outcomes. Understanding the social situation of pregnant women and all the sociodemographic factors that surround them is essential to effectively contribute to reducing cases of gestational toxoplasmosis.

Descriptors: Toxoplasmosis; Parental Care; Womens Health; Epidemiology; Comprehensive Health Care.

RESUMEN

Objective: El objetivo fue describir el perfil epidemiológico de los casos de toxoplasmosis gestacional notificados en Alagoas entre 2019 y 2023. **Métodos:** Se trata de un estudio ecológico, descriptivo, retrospectivo y cuantitativo, basado en datos del sistema TabNet. **Resultados:** Se registraron 898 casos en el período analizado. Los resultados muestran que la evolución de la enfermedad, relacionada con el trimestre gestacional, la raza, la edad y la escolaridad, refleja las condiciones socioeconómicas de la población. **Conclusión:** También se destaca que el diagnóstico precoz favorece resultados positivos. Comprender el contexto social de la gestante es esencial para reducir los casos de toxoplasmosis gestacional

Descriptors: Toxoplasmosis; Atención Prenatal; Salud de la Mujer; Epidemiología; Atención Integral de Salud.

ORIGINAL

Introduction

Toxoplasmosis is a worldwide zoonosis caused by the obligate intracellular protozoan *Toxoplasma gondii*. The disease infects one-third of the global population and is highly infectious but has low pathogenicity. Toxoplasmosis during pregnancy is a concern due to the risk of vertical transmission.[1-2]

In this context, the disease is more severe if it occurs early in pregnancy, as it can cause serious clinical manifestations in the fetus. The most common sequela related to congenital toxoplasmosis is vision loss, but chorioretinitis, intracerebral calcification, hydrocephalus, mental retardation, and hearing loss can also occur.[3]

Although most congenital infections result from a primary infection acquired during pregnancy, transplacental transmission can occur in some cases involving immunocompetent women previously exposed to the parasite who are infected with a genetically distinct strain during gestation.[4-5]

Gestational and congenital toxoplasmosis are extremely neglected conditions. Most studies on toxoplasmosis in pregnancy seek to estimate the prevalence of the disease or infection and its risk factors. On the other hand, it is essential to understand that knowledge and preventive behavior regarding toxoplasmosis in pregnancy can contribute to the initiation of primary prevention actions, which are fundamental for guiding public policies.[1,3]

Prenatal care aims to identify and stratify risk factors, screen for diseases, prevent potential pregnancy complications, and ensure a healthy pregnancy and delivery without intercurrences. The requested laboratory tests, in turn, play a fundamental role, favoring earlier diagnosis and the initiation of treatment when possible. A vast array of diagnostic resources is currently available, making it essential to identify those relevant to the gestational period.[6-7]

In light of the above, it is necessary to broaden the discussion about toxoplasmosis contamination during pregnancy, as it directly impacts gestational and neonatal outcomes. Furthermore, it is highly important to view Primary Care and prenatal consultations as drivers of health education, through the adoption of strategies for quality prenatal care, promoting health for pregnant women, preventing diseases and complications, with the aim of reducing the number of gestational toxoplasmosis cases..

It is from this perspective that the present study is guided by the question: "What is the epidemiological profile of pregnant women with toxoplasmosis in Alagoas in recent years, and how does prenatal care function as a driving agent in controlling this infection?"

Therefore, the study aims to describe the epidemiological profile of reported gestational toxoplasmosis cases in Alagoas from 2019 to 2023.

Method

This is an ecological, descriptive, and retrospective epidemiological study with a quantitative approach, conducted between November 2023 and April 2024, using secondary data collection from the Department of Data Analysis and Tabulation of the Unified Health System (DATASUS).

Cases of gestational toxoplasmosis reported in Alagoas between 2019 and 2023 were retrospectively evaluated. Maternal variables include data on: race, toxoplasmosis result classification (confirmed, discarded, inconclusive), year of notification, outcome (disease progression), age group, gestational trimester, laboratory and clinical-epidemiological data. These variables were associated and described in absolute and relative frequencies organized in *Microsoft Excel software.*

Data analysis used descriptive statistics, with results presented in tables and graphs.

This study did not require approval from the Research Ethics Committee (CEP) to be conducted, as stated in Resolution 510 of April 1, 2016.

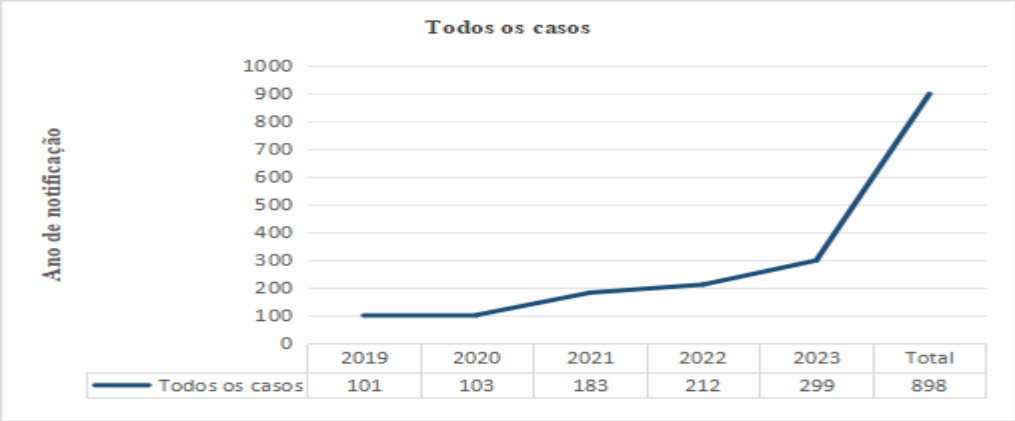
Thus, the data presented here do not expose the identity of the involved population and are in accordance with the bioethical principles governing studies with human beings: autonomy, beneficence, non-maleficence, and justice.

Results

Epidemiological Data

A total of 898 reported cases of gestational toxoplasmosis were recorded between 2019 and 2023. Of the total cases recorded in the last 5 years, the highest number was in 2023, with 299 notifications (Figure 1).

Figure 1 - Cases of Gestational Toxoplasmosis by Year of Notification, registered between 2019 and 2023, Alagoas, 2024.



Source: Ministério da Saúde/SVS - Sistema de Informações de Agravos de Notificação - Sinan Net. April 2024.

It is possible to observe an increase in the number of cases after the years following the Covid-19 pandemic, raising the question of whether there was indeed a higher infection rate by Toxoplasma gondii, or if in the years preceding and during the pandemic there was underreporting of the disease.

Among the diagnostic criteria presented in the investigated years, it was observed that between 2019 and 2023, 716 (79.73%) notifications included a record of laboratory diagnosis. This was more frequent in 2023 (n=241, 80.60%) (Table 1).

In addition, in the years 2019 (n=12, 11.65%) and 2020 (n=36, 19.67%), there was a higher number of notifications without diagnostic criteria (Table 1).

Table 1 – Cases of gestational toxoplasmosis by diagnostic criterion, recorded between 2019 and 2023, Alagoas, 2024.

				n(%)
Year of notification	**Ignored/Blank**	**Laboratory**	**Clinical-epidemiological**	**Total**
2019	11(10,89)	88(87,13)	2(1,98)	101
2020	12(11,65)	83(80,58)	8(7,77)	103
2021	36(19,67)	140(76,50)	7(3,83)	183
2022	36(16,98)	164(77,36)	12(5,66)	212
2023	44(14,72)	241(80,60)	14(4,68)	299
Total	139(15,48)	716(79,73)	43(4,79)	898(100)

Source: Ministry of Health/SVS – Notifiable Diseases Information System – Sinan Net. April 2024.

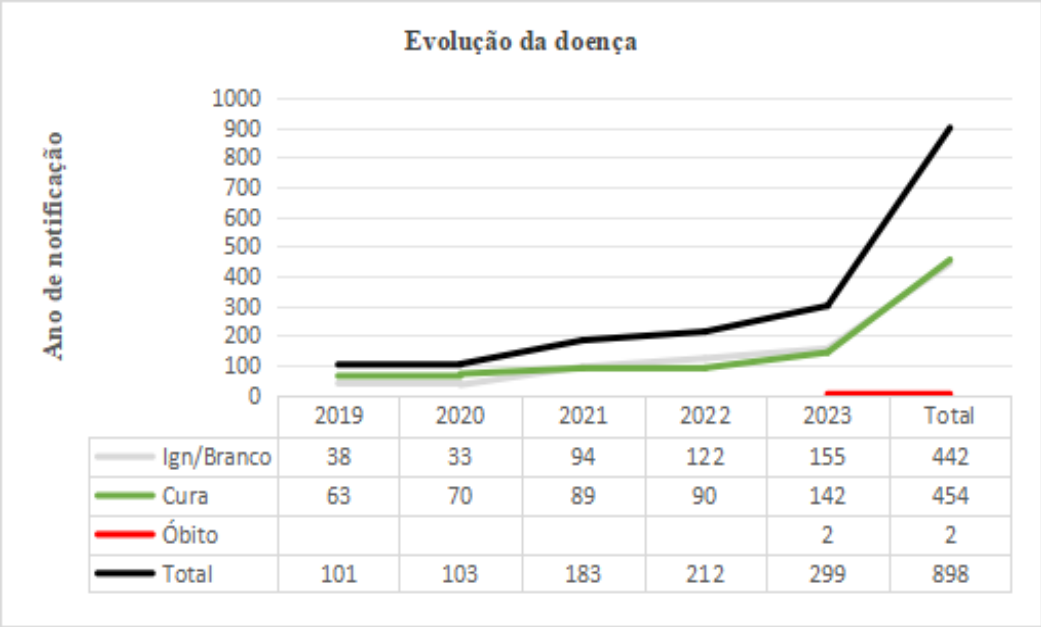
However, some cases did not present a record of the type of diagnostic criterion, mainly between the years 2020 and 2021, with 12 (11.65%) and 36 (19.67%), respectively (Table 1).

According to the diagnostic criterion, excluding the cases reported without this information, it was observed that the most representative criterion was the laboratory-based, followed by the clinical-epidemiological, with 4.79% (n=43) of reported records (Table 1).

Of the 898 cases reported during the described period, 715 (79.62%) were confirmed as gestational toxoplasmosis, while 39 (4.34%) were ruled out. Again, the year 2023 showed the highest number of confirmed cases, with a total of 299 notifications and 244 (81.61%) confirmed cases of the disease.

The year 2023 was marked by the first records of gestational deaths due to toxoplasmosis, with two notifications (0.67%) (Figure 2). However, once again, a significant number of cases without a record of cure or death was observed, especially in the years 2022 and 2023, with 122 (57.55%) and 155 (51.84%), respectively (Figure 2).

Figure 2 - Cases of Gestational Toxoplasmosis by Year of Notification and Outcome, registered between 2019 and 2023, Alagoas, 2024.



	2019	2020	2021	2022	2023	Total
Ign/Branco	38	33	94	122	155	442
Cura	63	70	89	90	142	454
Óbito					2	2
Total	101	103	183	212	299	898

Source: Ministry of Health /SVS - Notifiable Diseases Information System - Sinan Net. April 2024.

A total of 442 (49.22%) cases were identified as ignored/blank. When added to the total number of Cure outcomes recorded in recent years, which is 454 (50.56%) cases, the sum approaches the total number of reported cases (898) (Chart 2).

Sociodemographic Data

Sociodemographic data present variables related to age group, race, and education level, associated with the diagnosis of gestational toxoplasmosis from 2019 to 2023.

The notified pregnant women were predominantly self-declared as Parda (Mixed-race) (69.38%), White (15.70%), and Black (6.68%). Only 8 (0.89%) self-declared as Yellow (Amarela - of East Asian descent) and 7 (0.78%) as Indigenous.

Among the notifications made between 2019 and 2023, 715 cases were confirmed as gestational toxoplasmosis, while 39 pregnant women had their diagnosis dismissed. The population of Parda (Mixed-race) pregnant women (n=503, 70.35%) represents the highest number of confirmed cases.

The majority of the pregnant women have Complete High School Education (Ensino Médio Completo) (n=211, 23.50%), and among these, 110 (24.23%) resulted in a cure for the disease (Table 2).

Table 2 - Cases of Gestational Toxoplasmosis by Outcome and Education Level, registered between 2019 and 2023, Alagoas, 2024.

									n(%)
Outcome	**Ign/ Blank**	**Illiterate**	**Elem. Inc.**	**Elem. Comp.**	**High Sch. Inc.**	**High Sch. Comp.**	**High. Ed. Inc.**	**High. Ed. Comp.**	**Total**
Ign/ Blank	155(35,07)	8(1,81)	80(18,10)	28(6,33)	46(10,41)	101(22,85)	9(2,04)	15(3,39)	442
Cure	120(26,43)	1(0,22)	108(23,79)	37(8,15)	56(12,33)	110(24,23)	8(1,76)	14(3,08)	454
Death due to notified injury	-	-	-	-	2(100)	-	-	-	2
Total	275(30,62)	9(1,00)	188(20,94)	65(7,24)	104(11,58)	211(23,50)	17(1,89)	29(3,23)	898(100)

Source: Ministério da Saúde/SVS - Sistema de Informações de Agravos de Notificação - Sinan Net. April 2024.

Two death cases were reported due to the notified condition. These pregnant women had Incomplete High School Education (Ensino Médio Incompleto) (n=104, 11.58%).

Pregnancy Data

It was possible to characterize some data related to the pregnancy, such as the gestational trimester and its association with the age group of the notified pregnant women.

The largest age group among the 634 notified pregnant women was between 20 to 39 years old, with the 2nd trimester having the highest number of notifications for these women (48.74%).

The second most affected age group is represented by pregnant women between 15-19 years old, with the highest number of notifications during the 2nd gestational trimester (n=105, 47.51%).

Considering the disease outcome and its association with the gestational trimester, it was observed that although the 2nd trimester represents the one with the highest number of notifications, it also represents the period with the highest number of cures (n=222, 48.90%) between 14 and 26 weeks of gestation (Table 3).

Table 3 - Cases of Gestational Toxoplasmosis by Outcome and Gestational Trimester, registered between 2019 and 2023, Alagoas, 2024.

					n(%)
Outcome	**1st Trimester**	**2nd Trimester**	**3rd Trimester**	**Unknown Gest. Age**	**Total**
Ign/Blank	89(20,14)	214(48,42)	132(29,86)	7(1,58)	442
Cure	66(14,54)	222(48,90)	159(35,02)	7(1,54)	454
Death due to notified injury	1(50)	-	1(50)	-	2
Total	156(17,37)	436(48,55)	292(32,52)	14(1,56)	898(100)

Source: Ministério da Saúde/SVS - Sistema de Informações de Agravos de Notificação - Sinan Net. April 2024.

The two cases recorded as deaths due to the notified condition in the mentioned recent years occurred during the 1st and 3rd gestational trimesters (Table 3).

Discussion

Among other gestational infections, toxoplasmosis infects one-third of the global population, making the prevention of the disease during pregnancy highly important.[1-2]

A cohort study conducted in a municipality in Santa Catarina points out that by identifying the main associated risk factors, it is possible to intervene in a timely manner in the occurrence of the disease and thus reduce the incidence of unfavorable outcomes for the health of the fetus and newborn.[8]

The results of the present study provoke reflection not only on the cure or death outcomes that may have occurred in these infected mother-child dyads but also raise concerns about how the topic has been addressed and managed in Primary Health Care units and healthcare services providing prenatal care. It is noticeable that a high number of cases are diagnosed and reported late, at more advanced gestational ages, which makes the impact of toxoplasmosis in pregnancy even more severe.[9]

Recently, a Guidance Manual was developed in Brazil which, in addition to exploring flowcharts and addressing specific points of toxoplasmosis control, clearly presents potential epidemiological data for understanding the severity of the situation. For example, it states that over 90% of cases of pregnant women infected with *Toxoplasma gondii* are asymptomatic, substantiating that clinical diagnosis is of little value.[10]

In this study, the clinical-epidemiological diagnosis was the least representative (4.79%). However, despite being a low percentage, it is very important to acknowledge it, as these individuals may have had an unfavorable outcome compared to those who had a laboratory diagnosis in a timely manner.[10,14]

It is known that during prenatal care, the early identification and stratification of possible risk factors are important for successful screening, thus preventing potential pregnancy complications and ensuring a healthy pregnancy and delivery without intercurrences. Consequently, the requested laboratory tests play a significant role, as they favor a timely diagnosis.[7]

Regarding the specificities of contamination during the gestational period, the study showed that the progression of the disease associated with gestational trimesters, race, age group, and education level reflects the socioeconomic conditions of this population. It also demonstrates how early diagnosis favors positive outcomes, thereby consolidating what is described in other Brazilian studies.[4-5]

Sabin's tetrad reiterates the importance of early detection still in the first trimester of pregnancy. In this mentioned tetrad, the author argues that the fetus can present outcomes of malformation (chorioretinitis, cerebral calcifications, neurological disturbances, macrocephaly or microcephaly) and may even progress to death.[4-5]

Knowledge of such outcomes in the context of care for gestational toxoplasmosis is essential, as it allows healthcare professionals to understand that infections that go unnoticed at birth or are not treated also cause delays in mental development in the child's second or third decade of life. Consequently,

this study observed the 2nd trimester as the one with the highest number of notifications and cures for the disease between 14 and 26 weeks of gestation.[4-5]

Recent international studies indicate that the highest occurrence of congenital toxoplasmosis was associated with late diagnosis during the third gestational trimester. For example, a cohort study conducted in Italy between 2001 and 2012 shows that there was a higher incidence of congenital toxoplasmosis in mothers infected during the third trimester of pregnancy.[3,10]

Such data regarding the association with the affected gestational trimester are extremely relevant for understanding the entire context and conditions of the pregnancy and, consequently, the failures in disease prevention actions during pregnancy. Prenatal monitoring allows for the visualization of gaps in the public health system, thereby promoting care protocols more targeted to specific populations. However, these are not available in the public system for viewing notification data of the SUS (Unified Health System).[10,14]

This study revealed that the majority of pregnant women affected by the disease had completed high school as their education level (23.50%). This reaffirms that socioeconomic conditions and education level are directly associated with the ways of understanding the disease and increased responsibility for its prevention. It also validates the reflection that education directly influences health-seeking behavior.[8]

Regarding socioeconomic conditions, it is important to highlight that the largest representation in this study was of self-declared Parda (Mixed-race) women. Similar studies indicate that attendance to prenatal care is lower in the case of Black, Parda women, those with lower income and education, and particularly for those residing in the North and Northeast regions of Brazil. Furthermore, the mentioned regions present the worst performances in prenatal care, and also record a significant percentage of the indigenous population.[6]

Therefore, education level reflects socioeconomic conditions, which can be seen as determinants of health and well-being. Thus, it can be inferred that pregnant women with lower education levels present greater vulnerability regarding their health, including susceptibility to gestational infections.[8]

Consequently, when dealing with infectious diseases like toxoplasmosis, it is important to emphasize that health education is the best prevention strategy to consequently reduce the infection of pregnant women, since the laboratory and clinical diagnosis of the disease is complex and the treatment is not entirely effective.[5]

The progression of gestational toxoplasmosis cases over the past five years is characterized by an increase in notifications, particularly in the most recent reporting years. This finding raises important questions for the present study regarding the conditions under which cases are being recorded, potential underreporting or inconsistencies in the published data, and most importantly, concerns about the preventive role and health education expected from Primary Care services.[6,9,10,14]

Conclusion

In light of this, the need to expand protocols for the diagnostic approach of the disease in a timely manner is recognized, as well as to standardize a plan for the control, promotion, and prevention of the disease throughout the State..

Early diagnosis and timely treatment are conditions that favor a positive outcome for cases of the disease. However, it would be extremely important for policies for the prevention and care of women intending to become pregnant to be present in routine consultations and reproductive counseling and planning, thus aiming to promote early knowledge about toxoplasmosis and other diseases and prevent their transmission.

It is important to reflect on the conditions under which prenatal care is provided nationally, given that, in a developing country like Brazil, there are precarious services, unhealthy conditions, extreme poverty, a lack of basic sanitation, and the absence of minimum conditions that could prevent infection by *Toxoplasma gondii*. This becomes a challenge for prenatal care professionals when conducting health education, providing guidance and prevention methods within the prevailing socioeconomic conditions.

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Corresponding Author:
Amuzza Aylla Pereira dos Santos
R. Dr. Jorge de Lima, 113. ZIP 57010-300,
Trapiche da Barra. Maceió, Alagoas, Brazil.
amuzza.santos@gmail.com