

Profile and follow-up of children exposed to congenital infections: challenges in referral and adherence to specialized care follow-up

Abstract

Introduction: Congenital infections remain an important cause of infant morbidity and mortality and may lead to systemic manifestations, neurological involvement, and late sequelae. Specialized follow-up of these children is essential for early diagnosis, clinical monitoring, and timely initiation of treatment. However, difficulties related to access to specialized consultations and continuity of follow-up may compromise the effectiveness of care.

Objective: To identify the main congenital infections referred to a pediatric infectious diseases outpatient clinic, describe the time until the first consultation, evaluate absenteeism, and analyze the adequacy of referrals according to healthcare protocols.

Methods: This was an observational, cross-sectional, and retrospective study conducted through the analysis of electronic medical records of newborns exposed to congenital infections referred to a pediatric infectious diseases service at a teaching hospital between April and December 2023. Collected data included diagnosis related to exposure, presence of coinfections, referral method, time until the first consultation, absenteeism, and adequacy of follow-up according to established protocols. The results were analyzed using descriptive statistics.

Results: A total of 360 newborns were evaluated. The main identified exposure was syphilis (70.6%), followed by human immunodeficiency virus (HIV) (11.7%), toxoplasmosis (10.0%), hepatitis B (4.2%), hepatitis C (2.8%), cytomegalovirus (1.9%), and herpes simplex virus (1.4%). Coinfections occurred in 5.8% of cases. The median time until the first consultation was 33 days, ranging from 14 to 244 days. Primary absenteeism was observed in 66.2% of referred patients. The healthcare protocol was considered inadequate in 28.4% of cases, mainly due to failure to attend the initial consultation, delays in follow-up, and loss to follow-up.

Conclusion: Although most referrals followed the established healthcare protocols, the high absenteeism rate compromised continuity of care. The findings reinforce the need for integrated strategies involving maternity services, primary healthcare, and specialized services to ensure adherence to follow-up among children exposed to congenital infections.

Keywords: vertical transmission, congenital infections, outpatient follow-up, congenital syphilis, HIV

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Introduction

Congenital infections acquired during pregnancy or the peripartum period remain among the leading causes of neonatal morbidity and mortality and may result in systemic, neurological, ophthalmological manifestations and impairment of neuropsychomotor development.¹⁻⁴ Among the main infections related to vertical transmission and associated with pre-established care pathways are syphilis, human immunodeficiency virus (HIV), toxoplasmosis, cytomegalovirus, herpes simplex virus (HSV), and viral hepatitis.⁵

Clinical manifestations may be present at birth or emerge later, months or even years after the neonatal period. In many cases, neurological, auditory, ophthalmological, and cognitive alterations may only be identified throughout child development, making longitudinal follow-up of these children essential.⁶

In addition to early diagnosis during prenatal care or the neonatal period, specialized outpatient follow-up represents a fundamental stage of care.⁶ National protocols recommend specific clinical and

laboratory follow-up for children exposed to congenital infections, especially in cases with a higher risk of vertical transmission or development of sequelae.⁷⁻¹⁰

In the case of HIV, for example, the timely initiation of antiretroviral therapy is associated with a significant reduction in infant morbidity and mortality.² Similarly, children exposed to congenital toxoplasmosis may develop late manifestations even when initially asymptomatic, reinforcing the need for prolonged monitoring.⁹

Despite the existence of well-established healthcare protocols, difficulties related to access to specialized care, organization of referral pathways, and adherence to follow-up still represent relevant challenges for healthcare services. Loss to follow-up may delay diagnoses, compromise timely treatment, and hinder early interventions. Furthermore, the increasing number of referrals to specialized services and the limited availability of specialized professionals make continuous evaluation of healthcare pathways necessary in order to identify delays, loss to follow-up, and unnecessary referrals.

In this context, understanding the profile of children referred for specialized follow-up and the main factors related to continuity of care may contribute to improving healthcare strategies and strengthening integration among maternity services, primary healthcare, and specialized services.

The present study aimed to identify the main congenital infections referred to a pediatric infectious diseases outpatient clinic, describe the time until the first consultation, evaluate absenteeism, and analyze the adequacy of referrals according to established protocols.

Methods

This was an observational, cross-sectional, and retrospective study conducted through the analysis of electronic medical records of newborns exposed to congenital infections referred to the pediatric infectious diseases service at a teaching hospital in Southern Brazil between April and December 2023.

The hospital where the study was conducted is a tertiary teaching hospital and a regional referral center for the care of high-risk pregnancies. Among the conditions monitored by the service, infections included in the toxoplasmosis, rubella, cytomegalovirus, herpes simplex, and syphilis (TORCHS) group stand out, with specialized prenatal care, fetal monitoring, and neonatal follow-up provided for pregnant women affected by these infections and for their respective newborns/children exposed during the gestational period.

Patients born at the hospital and referred for specialized evaluation due to intrauterine or peripartum exposure to congenital infections were included in the study. Collected data included diagnosis related to exposure, presence of coinfections, referral method, time until the first consultation, absenteeism, and adequacy of follow-up according to healthcare protocols.

The information was organized into an electronic database and analyzed using descriptive statistics, including frequencies, percentages, means, and medians. P values <0.05 were considered statistically significant.

The study was approved by the institution's Research Ethics Committee under opinion number 6.553.277.

Results

A total of 360 newborns exposed to congenital infections were evaluated. The main identified exposure was syphilis (254 cases, 70.6%), followed by HIV (42 cases, 11.7%), toxoplasmosis (36 cases, 10.0%), hepatitis B (15 cases, 4.2%), hepatitis C (10 cases, 2.8%), cytomegalovirus (7 cases, 1.9%), herpes simplex virus (5 cases, 1.4%), and other infections (6 cases, 1.7%). Among the other infections observed were coronavirus disease 2019 (COVID-19), human T-cell lymphotropic virus (HTLV), tuberculosis, herpes zoster, and sporotrichosis. In addition, 4 patients were initially investigated for suspected congenital infection, although diagnostic confirmation was not established after complementary evaluation.

Coinfections occurred in 21 patients (5.8%). The most frequent association was between HIV and syphilis, followed by syphilis and toxoplasmosis. Cases involving viral hepatitis associated with other congenital infections were also observed.

Among the cases of syphilis exposure, 129 pregnant women (51.2%) had treatment considered adequate, whereas 85 (31.8%) corresponded to serological scars. In 38 cases (15.0%), maternal treatment was considered inadequate. The main identified reason was irregular treatment during prenatal care, followed by increased

Venereal Disease Research Laboratory (VDRL) titers despite previous adequate treatment. There were also cases in which therapeutic irregularity and increased serological titers coexisted.

Resorting to HIV exposure cases, 22 patients (52.3%) were classified as low risk for vertical transmission, whereas 19 (45.2%) were considered high risk. Factors associated with higher risk included detectable maternal viral load during the third trimester of pregnancy and irregular use of antiretroviral therapy during gestation. 1 case was also identified in which maternal diagnosis was established only at the time of delivery.

Regarding the 36 patients exposed to toxoplasmosis, probable maternal diagnosis predominated (25 cases, 69.4%), whereas 7 pregnant women (19.4%) had confirmed toxoplasmosis diagnoses. In a smaller proportion of cases, complementary investigation allowed exclusion of maternal infection (4 cases, 11.1%).

With respect to viral hepatitis, 15 patients were exposed to hepatitis B, among these, 13 (80.0%) maintained the diagnosis of hepatitis B exposure, whereas in 3 cases (20.0%) maternal hepatitis B infection was ruled out. Among the 10 patients exposed to hepatitis C, 7 (70.0%) had exposure subsequently excluded because maternal anti-HCV serology represented either a false-positive result or previously cured infection. A significant proportion of cases initially classified as hepatitis C exposure were therefore later excluded, mainly due to false-positive results or maternal history of previously treated infection.

After the initial evaluation in the maternity ward, requests for specialized follow-up were made for 139 patients (38.6%). Most referrals were carried out through primary healthcare services, whereas a small proportion received appointments directly through the hospital's internal scheduling system.

The median time until the first consultation was 33 days, ranging from 14 to 244 days (95% CI: 41.02 to 58.75 days). Although the median interval was compatible with recommendations established by healthcare protocols, a high rate of primary absenteeism was observed, affecting 66.2% (92 patients) of those referred for specialized follow-up.

The healthcare protocol was considered inadequate in 102 cases (28.4%). The main identified reasons were failure to attend the initial consultation requiring a new referral (60 cases, 58.8%), delay in performing the first specialized evaluation (29 cases, 28.4%), referrals considered unnecessary for pediatric infectious diseases evaluation (7 cases, 6.9%), and absence of registered information regarding continuity of follow-up/loss to follow-up (6 cases, 5.9%).

The highest rates of protocol inadequacy occurred among patients exposed to toxoplasmosis and viral hepatitis. Conversely, greater compliance with healthcare protocols was observed among cases related to syphilis and HIV.

Discussion

Syphilis was the main infection identified among exposed newborns, a result consistent with the national epidemiological scenario observed in recent years.⁵ Despite the availability of diagnostic methods and effective prenatal treatment, congenital syphilis remains an important public health problem, frequently associated with failures in prenatal care and maternal treatment.¹¹

In the present study, among the cases classified as inadequately treated, the main identified reason was irregular treatment during pregnancy. This finding reinforces the importance of strategies aimed

at early diagnosis, therapeutic adherence, and appropriate monitoring of pregnant women during prenatal care. The persistence of congenital syphilis as a preventable condition highlights weaknesses in maternal-child healthcare and continuity of care during pregnancy.

HIV constituted the second most frequent exposure observed. Although strategies for preventing vertical transmission have significantly reduced pediatric cases in recent decades, specialized follow-up remains essential, especially in situations classified as higher risk.^{2,12} The high proportion of pregnant women with detectable viral load during the third trimester highlights the need to strengthen adherence strategies for antiretroviral therapy during pregnancy. The literature demonstrates that elevated maternal viral load represents one of the main factors associated with vertical HIV transmission.² Furthermore, longitudinal follow-up of exposed children remains necessary for clinical and laboratory monitoring and for the early identification of possible complications related to intrauterine exposure and the use of antiretroviral prophylaxis.¹³

Toxoplasmosis also demonstrated important clinical relevance, particularly because of the possibility of late manifestations and neurological, auditory, and ophthalmological sequelae.^{4,14} Even children who are initially asymptomatic may develop alterations throughout development, making longitudinal follow-up and periodic evaluation indispensable.

Diagnostic challenges, inappropriate interpretation of serological tests, and heterogeneity of care pathways contribute to the high rate of protocol inadequacy observed in toxoplasmosis and viral hepatitis cases.

One of the main findings of this study was the high absenteeism rate at the first specialized consultation. Although the median time until care among those who attended was compatible with national protocol recommendations, the frequency of non-attendance significantly compromised the effectiveness of specialized follow-up.

This result demonstrates that access to care depends not only on the availability of appointments or referral completion, but also on effective coordination among healthcare levels. Difficulty adhering to follow-up may be related to social factors, family vulnerability, geographic barriers, and weaknesses in communication among healthcare services. In more vulnerable populations, these factors tend to directly impact continuity of care.

Furthermore, both unnecessary referrals and loss to follow-up were observed, reinforcing the need to strengthen continuing education for healthcare professionals, standardize healthcare pathways, and expand active case-finding strategies. Integrated, patient-centered care models, with shared responsibilities among maternity services, primary healthcare, and specialized care, may contribute to reducing loss to follow-up.

As limitations, the retrospective design and dependence on information recorded in electronic medical records should be highlighted, as these may result in data loss or inconsistencies related to record completion. In addition, because this study was conducted in a single tertiary referral center, the results may reflect particularities of the local healthcare pathway, although challenges related to follow-up and adherence to specialized monitoring are frequently observed in other healthcare settings.

Conclusion

The study is relevant in demonstrating practical aspects related to the care of children exposed to congenital infections, especially

with regard to continuity of outpatient follow-up. The findings may contribute to the improvement of care coordination strategies, strengthening communication among different levels of healthcare, and the development of measures aimed at reducing loss to follow-up.

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Conflicts of interest

The authors declare that there are no conflicts of interest.

References

1. Giannattasio A. *Overview of TORCH infections*. UpToDate. Waltham, MA: UpToDate Inc.
2. Weinberg A. *Diagnostic testing for HIV infection in infants and children younger than 18 months*. UpToDate. Waltham, MA: UpToDate Inc.
3. Ostrander B, Bale JF. Congenital and perinatal infections. *Handb Clin Neurol*. 2019;162:133–153.
4. Devaraju M, Li A, Ha S, et al. Beyond TORCH: A narrative review of the impact of antenatal and perinatal infections on the risk of disability. *Neurosci Biobehav Rev*. 2023;153:105390.
5. Korenromp EL, Rowley J, Alonso M, et al. Global burden of maternal and congenital syphilis and associated adverse birth outcomes—Estimates for 2016 and progress since 2012. *PLoS One*. 2019;14(2):e0211720.
6. Neu N, Duchon J, Zachariah P. TORCH infections. *Clin Perinatol*. 2015;42(1):77–103.
7. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Doenças de Condições Crônicas e Infecções Sexualmente Transmissíveis. *Manual técnico para o diagnóstico da sífilis*. Brasília, DF: Ministério da Saúde; 2021;70 p.
8. Brasil. Ministério da Saúde. *Protocolo clínico e diretrizes terapêuticas para manejo da infecção pelo HIV em crianças e adolescentes – Módulo 2: Diagnóstico, manejo e tratamento de crianças e adolescentes vivendo com HIV*. Brasília, DF: Ministério da Saúde; 2024.
9. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Vigilância das Doenças Transmissíveis. *Protocolo de notificação e investigação: toxoplasmose gestacional e congênita*. Brasília, DF: Ministério da Saúde; 2018;31p.
10. Brasil. Ministério da Saúde. Secretaria de Vigilância em Saúde. Departamento de Vigilância, Prevenção e Controle das Infecções Sexualmente Transmissíveis, do HIV/Aids e das Hepatites Virais. *Manual Técnico para o Diagnóstico das Hepatites Virais*. Brasília, DF: Ministério da Saúde; 2018;123p.
11. Reyes MP, Hunt N, Ostrea Jr EM, et al. Maternal/congenital syphilis in a large tertiary-care urban hospital. *Clin Infect Dis*. 1993;17(6):1041–1046.
12. Aurélio M, Sáfadi P, Oliveira C, et al. *Estratégias de prevenção da infecção pelo HIV em crianças e adolescentes*. Sociedade Brasileira de Pediatria. Sociedade Brasileira de Pediatria. 2024.
13. Steffi N, Mendes LF, Rossoni A, et al. Analysis of the profile of mothers and children with intrauterine exposure to HIV born in a tertiary public maternity hospital in southern Brazil. *Residência Pediátrica*. 2024;14(1):1–6.
14. McLeod R, Kieffer F, Sautter M, et al. Why prevent, diagnose and treat congenital toxoplasmosis? *Mem Inst Oswaldo Cruz*. 2009;104(2):320–344.