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# Adherence to the follow-up of the newborn exposed to syphilis and factors associated with loss to follow-up

## *Aderência ao seguimento no cuidado ao recém-nascido exposto à sífilis e características associadas à interrupção do acompanhamento*

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**ABSTRACT:** ***Introduction:*** All newborns exposed to syphilis in pregnancy must have outpatient follow-up. The interruption of this follow-up especially threatens those children who were not treated at birth. ***Objective***: To describe the clinical, epidemiological, and sociodemographic characteristics of pregnant women with syphilis and their newborns, and to investigate the factors associated with the discontinuation of the follow-up. ***Methods:*** This is an observational, descriptive, analytical, and retrospective study of medical records of 254 children exposed to syphilis, who were assisted at the Congenital Infectious Clinic of the university hospital of the *Universidade Federal do Paraná*, between 2000 and 2010. The newborns were classified by reference according to their follow-up. Data were analyzed by means of the binary logistic regression model in order to identify the factors associated to drop out. ***Results:*** The factors associated to the interruption of the follow-up were maternal age over 30 years, mothers with 3 or more children, and the absence of cross-infections by HIV and/or viral hepatitis. ***Conclusion:*** Such findings demonstrate the need to identify these families and implement strategies to promote the establishment of bonds. A greater rigor to indicate the treatment of the disease at birth is recommended, as most of them do not properly follow up.

***Keywords:*** Syphilis, congenital. Female urogenital diseases and pregnancy complications. Infectious disease transmission, vertical. Infant, newborn, diseases. Lost to follow-up. Prenatal care.

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**RESUMO:** ***Introdução:*** Todo recém-nascido exposto à sífilis na gestação deve ter acompanhamento ambulatorial. A interrupção do seguimento põe em risco todos aqueles que não recebem tratamento ao nascer. ***Objetivo:*** Descrever as características clínicas e epidemiológicas dos recém-nascidos expostos à sífilis, assim como gestacionais e sociodemográficas de suas mães e investigar os fatores associados com a descontinuidade do seguimento. ***Métodos:*** Trata-se de um estudo observacional, descritivo, analítico e retrospectivo dos prontuários de 254 crianças expostas à sífilis, atendidas no Ambulatório de Infecções Congênitas do Hospital de Clínicas da Universidade Federal do Paraná, entre 2000 e 2010. Os recém-nascidos foram classificados por referência ao seu acompanhamento ou não. Os dados foram ajustados a um modelo de regressão logística binária, no sentido de identificar os fatores associados à descontinuidade do tratamento. ***Resultados:*** As características estatisticamente associadas à interrupção do seguimento na análise multivariada foram: mães com idade acima de 30 anos, paridade de três ou mais filhos e a ausência de coinfecções pelo HIV e/ou hepatites virais. ***Conclusão:*** Tais achados demonstram a necessidade de identificar essas famílias e estabelecer estratégias que incentivem a formação de vínculos. Recomenda-se que os critérios de tratamento dos recém-nascidos tenham maior rigor, visto que a maior parte deles não faz o seguimento adequado.

***Palavras-chave:*** Sífilis congênita. Doenças urogenitais femininas e complicações na gravidez. Transmissão vertical de doença infecciosa. Doenças do recém-nascido. Perda de seguimento. Cuidado pré-natal.

## INTRODUCTION

Congenital syphilis (CS) is a consequence of the transmission of *Treponema pallidum* of untreated or inadequately treated pregnant women[1-3]. The frequency of the vertical transmission (VT) in the primary and secondary stages of the disease ranges from 70 to 100%[4-7]. CS is associated with a number of medical conditions and serious sequelae[8]. In 80% of cases the outcomes are unfavorable, of which 40% result in stillbirth, 20% in perinatal death, and the remaining 20% in congenital infection[9].

Most babies infected with syphilis have no clinical manifestations at birth, which hinders the diagnosis and mother's awareness on the importance of the investigation and child follow-up. It is during the first years of life that joint, dental, and eye progressive injuries and irreversible sequelae, such as deafness and learning deficit can be developed[5]. To identify and monitor these individuals, the Brazilian Ministry of Health (MS)[5] elaborated diagnostic criteria of CS to be observed at birth and during outpatient follow-up. The first criterion includes a broad case definition, based on epidemiological, clinical, laboratory, and radiological investigations; the epidemiological criterion mainly includes maternal treatment during pregnancy and aims at covering the largest number of babies considered at risk, in order to indicate treatment when they have access to healthcare in the maternity; the other criterion establishes the diagnosis in children during the clinical and laboratory follow-up for up to 18 months of age[10].

Syphilis occurs in 1.6% of Brazilian women, according to the study *Sentinela Parturiente*, and impacts 15,000 children with CS per year[5]. The most effective preventive measures to avoid syphilis VT are early diagnosis in pregnant women and adequate maternal treatment[11-13]. However, although simple, accessible, and cost-effective[14], this treatment has not been properly applied, resulting in a steady increase in the number of cases of CS[13-15]. Although our country is a participant of a global plan launched nearly 20 years ago (1995) for the elimination of CS[15], the national rates has remained very high[16,17] and showed an increase of 71.4% between 2000 and 2010[18]. In Curitiba, Paraná, the number of cases increased 87.7% from 2001 to 2010[19].

In developed countries, the CS rates are considered reemerging disease. In Canada, after ten years without notifications, there were nine cases between 2005 and 2006[20]. In Italy, after five years with no records, two cases of symptomatic babies with mothers who were immigrants from Eastern Europe were described. In Switzerland, there were nine cases (eight among immigrants) of syphilis in ten years, and syphilis was removed from the notifiable diseases list in 1999, but returned in 2006[21].

The MS determines that every child exposed to syphilis during pregnancy, treated or not in the neonatal period, should be monitored in an outpatient unit[10]. However, the number of studies on the follow-up does not reflect the importance of the issue, especially in Brazil[22,23]. Therefore, sharing the experience of ten years of a referral service may contribute to the discussion of the topic. This research was conducted in a period of transition from hospital care as a reference to monitoring to decentralized care in basic health units (BHUs). This study describes the clinical and epidemiological characteristics of newborns (NB) exposed to syphilis and also the gestational and sociodemographic characteristics of their mothers as well as investigate the occurrence of an association of continuity of care to the newborn with maternal and NB characteristics.

## METHOD

This is an observational, cross-sectional, descriptive, analytical, and retrospective study, based on information from the medical records of children exposed to syphilis during pregnancy and of their mothers assisted in Congenital Infections Clinic of the University Hospital of the *Universidade Federal do Paraná* (HC-UFPR), between 2000 and 2010. This is the largest public hospital in Paraná, and the third largest federal university hospital in the country, which serves only the Unified Health System (SUS). Inclusion criterion was infants exposed to syphilis referred to the outpatient unit. Exclusion criteria were cases with insufficient information for analysis, maternal serologic scar, or proven false-positive test.

The information of 254 children was selected sequentially, from the dates patients were admitted in the unit, and computed in the service and in the Hospital Epidemiology Center databases. The results were presented for the total sample and according the child's follow-up outcomes. In the group "Follow-up Yes", children who were monitored

to confirm or discard the diagnosis were included. In the group "Follow-up No," children who quit the follow-up before clarifying the occurrence or not of VT, that is, before their discharge, were included.

Maternal sociodemographic characteristics such as maternal age, marital status, educational level in years of schooling, and residence location in Curitiba or outside the municipality were detailed. Maternal care considered the attendance to prenatal care (PC), the number of visits, parity, time of diagnosis of syphilis, the treatment received for syphilis, and the presence of coinfection by HIV and/or viral hepatitis. Maternal treatment was considered inappropriate if it was not carried out with penicillin; was incomplete according to the stage of the disease; was not completed within 30 days of birth; the serologic titers were not reduced by four times in the venereal disease research laboratory (VDRL) test; partner was not treated or was not treated concomitantly; there was lack of evidence of the treatment of both[10].

The epidemiological characteristics of NB were gender, weight, gestational age, weight according to gestational age, clinical, laboratory, radiological signs and symptoms, and type of treatment received at birth. Hepatomegaly, splenomegaly, skin lesions (palmoplantar pemphigus, flat condyloma), respiratory distress with pneumonia, and serosanguineous rhinitis were considered as clinical evidence of the CS in NB; anemia, jaundice, thrombocytopenia, leukocytosis, and leukopenia were considered as laboratory alterations; leukocytosis (more than 25 white blood cells/$mm^3$), protein concentration in cerebrospinal fluid (CSF) above 150 mg/dl, and positive VDRL test in CSF were considered alterations in cellularity and/or CSF biochemical profile; long bones metaphyseal and diaphyseal involvement (tibia, femur, and humerus), osteochondritis, osteitis, and/or periostitis were considered as radiological findings[10,24].

To describe the distribution of the total sample data and analyzing them, Kolmogorov–Smirnov test, Student's *t*-test, Mann test, Pearson $\chi^2$, and Fisher's exact test were used. The significance level was 5%. For the multivariate model, results with $p \leq 0.250$ in the bivariate analysis[25] were used to select the significant variables. The binary logistic regression analysis (backward) was carried out in the software SPSS 20. The study was approved by the Ethics Committee of the Secretariat of Health of the State of Paraná, of the *Hospital do Trabalhador* number 101, and was ratified by the Ethics Committee of HC-UFPR.

## RESULTS

The sample was composed of information collected from 254 medical records of children exposed to syphilis and of their mothers in the period from 2000 to 2010. The results were presented for the total sample and for the two following groups: "Follow-up Yes," which included those children who were monitored until their hospital discharge, according to the criteria recommended by the MS; and "Follow-up No" for those children who quit the follow-up, which represented 63.8% (n = 162) of the cases.

Sociodemographic characteristics of the mothers associated with the follow-up outcomes are presented in Table 1. The average age of the mothers was 26.6 ± 7.3 years, with greater participation of the age group of 20–29 years, which was equivalent to 48% (n = 118) of the records. There was association of maternal age under 20 years with the outcome "Follow-up Yes" ($p < 0.018$), whereas mothers aged over 30 years were 2.94 times more likely to quit the follow-up, with a 95% confidence interval (95%CI) of 1.88 – 11.55, that is, in the group "Follow-up No". The other maternal sociodemographic variables showed no statistically significant differences when comparing the groups who completed or not the follow-up (Table 1).

Table 2 shows that 86.6% (n = 220) of the mothers received PC, and among these, 42.1% (n = 107) attended six or more visits. With regard to the number of pregnancies, there was a median of 3.0 pregnancies in the group "Follow-up No", and 1.7 in the group who

Table 1. Distribution of sociodemographic variables of pregnant women for the total sample and according to the follow-up outcome of the newborn exposed to syphilis.

| Mother's characteristics | Total (n = 254)[a] | | Follow-up[b] | | | | p-value | Crude OR[c] (95%CI) |
|---|---|---|---|---|---|---|---|---|
| | | | No (n = 162) | | Yes (n = 92) | | | |
| | n | % | n | % | n | % | | |
| Age (years)[d] | 26.6 ± 7.3 | | 27.3 ± 7.4 | | 25.2 ± 6.9 | | 0.033[e] | 1.72 (1.27 – 4.61) |
| Age range 2 (years) - DA = 8 (3.1%) | | | | | | | | |
| Less than 20 | 46 | 18.7 | 24 | 52.2 | 22 | 47.8 | 0.018[f] | 1 |
| 20 – 29 | 118 | 48.0 | 77 | 65.3 | 41 | 34.7 | | 1.85 (1.29 – 4.71) |
| 30 or more | 82 | 33.3 | 59 | 72.0 | 23 | 28.0 | | 2.94 (1.8 – 1.55) |
| Marital status - DA = 42 (16.5%) | | | | | | | | |
| Married | 112 | 52.8 | 79 | 70.5 | 33 | 29.5 | 0.143[f] | 1.53 (0.86 – 2.71) |
| Single/divorced | 100 | 47.2 | 61 | 61.0 | 39 | 54.2 | | 1.0 |
| Years of schooling (years) - DA = 42 (16.5%) | | | | | | | | |
| Less than 8 | 107 | 65.2 | 69 | 64.5 | 38 | 35.5 | 0.230[f] | 1.0 |
| 8 or more | 57 | 34.8 | 42 | 73.7 | 15 | 26.3 | | 1.35 (0.81 – 2.23) |
| Place of residence - DA = 7 (2.7%) | | | | | | | | |
| Curitiba | 163 | 66.0 | 108 | 66.3 | 55 | 33.7 | 0.497[f] | 1.07 (0.87 – 1.31) |
| Other cities | 84 | 34.0 | 52 | 61.9 | 32 | 38.1 | | 1.0 |

[a]Percentages obtained based on the total sample (valid cases), [b]percentage obtained based on the total of each category response compared to the outcome; OR: *odds ratio*; [c]crude *odds ratios* for the outcome of "Follow-up No"; 95%CI: 95% confidence interval; [d]results presented as mean ± standard deviation, [e]Student's *t*-test for independent groups; [f]Pearson $\chi^2$; DA: missing data.

Table 2. Absolute and relative distribution of attendance to prenatal care, number of prenatal visits, diagnosis time, and maternal treatment; and mean, standard deviation, and median for the number of medical appointments for the total sample and according to the outcome of follow-up.

| Variables | Total (n = 254)[a] | | Follow-up | | | | p-value | Crude OR[c] (95%CI) |
|---|---|---|---|---|---|---|---|---|
| | | | No (n = 162) | | Yes (n = 92) | | | |
| | n | % | n | % | n | % | | |
| Prenatal care | | | | | | | | |
| No | 34 | 13.4 | 23 | 67.6 | 11 | 32.4 | 0.614[d] | 1.22 (0.56 – 2.63) |
| Yes | 220 | 86.6 | 139 | 63.2 | 81 | 36.8 | | 1.0 |
| Number of visits | | | | | | | | |
| 6 or more | 107 | 42.1 | 67 | 62.6 | 40 | 43.5 | 0.868[d] | 1.0 |
| Less than 6 | 113 | 44.5 | 72 | 63.7 | 41 | 36.3 | | 1.11 (0.87 – 1.84) |
| Number of pregnancies - DA = 29 (11.4%) | | | | | | | | |
| One | 56 | 24.9 | 29 | 51.8 | 27 | 48.2 | 0.001[d] | 1.0 |
| Two | 47 | 20.9 | 33 | 70.2 | 14 | 29.8 | | 1.96 (1.21 – 3.19) |
| Three | 43 | 19.1 | 38 | 88.4 | 5 | 11.6 | | 2.68 (1.65 – 6.44) |
| Four or + | 79 | 35.1 | 50 | 63.3 | 29 | 36.7 | | 1.72 (1.12 – 4.06) |
| Time of the diagnosis | | | | | | | | |
| 1º quarter | 72 | 28.3 | 38 | 52.8 | 34 | 47.2 | 0.130[d] | 1.0 |
| 2º quarter | 69 | 27.2 | 46 | 66.7 | 23 | 33.3 | | 1.19 (0.96 – 1.33) |
| 3º quarter | 56 | 22.0 | 40 | 71.4 | 16 | 28.6 | | 1.26 (1.09 – 1.85) |
| At birth | 57 | 22.4 | 38 | 66.7 | 19 | 33.3 | | 1.11 (0.74 – 1.27) |
| Treated syphilis | | | | | | | | |
| Properly | 42 | 16.5 | 24 | 57.1 | 18 | 42.9 | 0.614[d] | 1.0 |
| Inadequately | 142 | 55.9 | 92 | 64.8 | 50 | 35.2 | | 1.17 (0.94 – 1.32) |
| Not treated | 70 | 27.6 | 46 | 65.7 | 24 | 34.3 | | 1.28 (0.99 – 1.62) |
| Coinfection with HIV and viral hepatitis | | | | | | | | |
| No | 213 | 83.9 | 142 | 66.7 | 71 | 33.3 | 0.029[d] | 2.10 (1.08 – 4.13) |
| Yes | 41 | 16.1 | 20 | 48.8 | 21 | 51.2 | | 1.0 |

[a]Percentages obtained based on the total sample (valid cases), [b]percentage obtained based on the total of each category response compared to the outcome; OR: *odds ratio*; [c]crude *odds ratios* for the outcome of "Follow-up No"; 95%CI: 95% confidence interval; [d]Pearson $\chi^2$; DA: missing data.

completed the follow-up (p = 0.104). A significant difference (p = 0.001) associated with mothers with two or more pregnancies was identified; the risk of not continuing to attend the medical appointments was 2.68 (95%CI 1.65 – 6.44) times higher when compared with mothers with one pregnancy (Table 2). There was no statistically significant difference when compared the outcome of the follow-up in relation to the period of the syphilis diagnosis during pregnancy (Table 2).

After the diagnosis of syphilis, 72.4% of women reported having undergone some kind of treatment. Those treatments were appropriate in 16.5% (n = 42) of cases and inadequate in 55.9% (n = 142); 27.6% (n = 70) of patients did not undergo any treatment. Considering the 220 pregnant women who received PC, 178 (80.9%) were not treated properly or did not receive any treatment. The reasons for inadequate treatment were the absence of treatment for the partner in 83.1% (n = 118) of cases; inadequate treatment owing to no reduction of the VDRL levels in 45.7% (n = 65) of cases; treatment conducted within 30 days of childbirth in 30.3% (n = 43) of cases; inadequate dosage for the maternal disease staging in 14.1% (n = 20) of cases; and treatment with other drugs in 3.5% (n = 5) of cases. Significant association of the maternal treatment with follow-up outcome was not detected (Table 2).

In the evaluation of the presence or absence of coinfection with HIV and/or viral hepatitis, it was found that mothers with no coinfection were 2.10 (95%CI 1.08 – 4.13) times more likely to quit the follow-up (Table 2).

Analysis of the variables related to the NB showed that the distribution of gender and average weight is similar between the groups "Follow-up Yes" and "Follow-up No". NB who were small for gestational age (SGA) represented 16.6% of the sample and premature NB represented 17.7%, without indicating statistically significant difference (Table 3). NB showed an average weight of 2,918 g, ranging from 995 to 4,700 g. The clinical symptoms were observed in 3.5% (n = 9) of cases. Among the children, 93 were X-rayed, as recommended in the MS protocol, of which four (1.6%) presented with radiological alterations. Laboratory abnormalities were observed in 19.7% (n = 23) of the 107 children investigated by means of laboratory tests. NB with clinical, laboratory, and radiological alterations showed no statistically significant differences when comparing the follow-up outcomes (Table 3).

Among the NB, 180 (71.3%) underwent treatment as follows: treatment for ten days with crystalline penicillin in 63.9% (n = 115) of cases; single dose of benzathine penicillin in 36.1% (n = 65) of them. When this information was compared to the outcome, the cessation of the "Follow-up No" group prevailed, both in children treated with the single dose, 67.7% (n = 44), as in the treatment of ten days, 64.3% (n = 74; p = 0.650). When comparing the groups "Follow-up Yes" (who were discharged) and "Follow-up No," there was no statistically significant difference in relation to the duration of the treatment of the NB.

Children who did not need treatment totaled 29.1% (n = 74) of cases, of which 59.5% (n = 44) were in the group "Follow-up No," and 40.5% (n = 30) in the group of those who were discharged. There was no statistically significant difference concerning the treatment when compared to the follow-up groups.

Age range (three levels), marital status, years of schooling, number of pregnancies, time of the diagnosis, and absence of coinfection were considered as predictor variables to compose the multivariate model of the data previously presented.

Table 3. Absolute and relative distribution of the newborn's gender, weight, gestational age, clinical symptoms, laboratory, and radiological findings for the total sample and according to the follow-up of children exposed to syphilis during pregnancy.

| Newborn characteristics | Total[a] (n = 254) | | Follow-up[b] | | | | p-value | Crude OR[c] (95%CI) |
|---|---|---|---|---|---|---|---|---|
| | | | No (n = 162) | | Yes (n = 92) | | | |
| | n | % | n | % | n | % | | |
| Gender (DA = 2) | | | | | | | | |
| Female | 122 | 48.4 | 81 | 66.4 | 41 | 33.6 | 0.354[d] | 1.09 (0.9 – 1.3) |
| Male | 130 | 51.6 | 79 | 60.8 | 51 | 39.2 | | 1.0 |
| Weight (g) | 2918.1 ± 67.5 | | 2902.2 ± 68.3 | | 2946.1 ± 662.5 | | 0.62[d] | |
| SGA | 41 | 16.6 | 23 | 56.1 | 18 | 43.9 | 0.551[d] | 1.0 |
| AGA | 178 | 72.1 | 116 | 65.2 | 62 | 34.8 | | 1.33 (0.9 – 2.0) |
| BGA | 28 | 11.3 | 18 | 64.3 | 10 | 35.7 | | 0.96 (0.6 – 1.1) |
| Gestational age (DA = 5) (2.0%) | | | | | | | | |
| Preterm | 44 | 17.7 | 27 | 61.4 | 17 | 38.6 | 0.751[d] | 1.0 |
| At term | 205 | 82.3 | 131 | 63.9 | 74 | 36.1 | | 0.96 (0.7 – 1.2) |
| Clinical symptoms[e] | | | | | | | | |
| Yes | 9 | 3.5 | 5 | 55.6 | 4 | 44.4 | 0.601 | 0.70 (0.2 – 2.7) |
| No | 245 | 96.5 | 157 | 64.1 | 88 | 35.9 | | 1.0 |
| Laboratory alterations[f] | | | | | | | | |
| Yes | 23 | 19.7 | 13 | 56.5 | 10 | 43.5 | 0.173 | 1.51 (0.9 – 0.7) |
| No | 94 | 80.3 | 67 | 71.3 | 27 | 28.7 | | 1.4 |
| Radiological alterations | | | | | | | | |
| Yes | 4 | 1.6 | 2 | 50.0 | 2 | 50.0 | 0.563 | 0.70 (0.2 – 2.7) |
| No | 250 | 18.5 | 160 | 64.0 | 90 | 35.0 | | 1.0 |

[a]Percentages obtained based on the total sample (valid cases), [b]percentage obtained based on the total of each category response compared to the outcome; OR: *odds ratio*; [c]crude *odds ratios* for the outcome of "Follow-up No"; 95%CI: 95% confidence interval; [d]Pearson $\chi^2$; SGA: small for gestational age; AGA: appropriate for gestational age; BGA: big for gestational age; DA: missing data; [e]sum of the cases of hepatomegaly, splenomegaly, rhinitis, skin lesions, pseudoparalysis; [f]sum of cases with cerebrospinal fluid and blood disorder.

According to the results obtained (Table 4), the probability of interrupting treatment was 5.32 times greater among mothers aged over 30 years, with an *odds ratio* (OR) = 5.32 and 95%CI 1.90 – 11.87. Cessation of the follow-up ("Follow-up No") was higher among those women with more than three pregnancies: OR = 4.64 (95%CI 1.81 – 12.07); OR = 2.145 (95%CI 1.24 – 5.42). The probability of interrupting the follow-up was higher among mothers without coinfection with HIV or viral hepatitis (OR = 1.98; 95%CI 1.95 – 9.41).

Table 4. Model for the multiple logistic regression analysis to predict the abandonment outcome.

| Variables | Total sample | | Abandonment (n = 249) | | Regression coefficient | | Adjusted OR | |
|---|---|---|---|---|---|---|---|---|
| | n | % | n | % | B | p-value | OR | 95%CI |
| Age group (years) | | | | | | | | |
| Less than 20 | 46 | 18.7 | 24 | 52.2 | | | 1.0 | |
| 20 – 29 | 118 | 48.0 | 77 | 65.3 | 1.551 | 0.04 | 1.59 | 1.291 – 5.858 |
| 30 or more | 82 | 33.3 | 59 | 72.0 | 1.972 | 0.007 | 5.32 | 1.897 – 11.867 |
| Marital status | | | | | | | | |
| With partner | 112 | 52.8 | 79 | 70.5 | 0.278 | 0.641 | 1.32 | 0.412 – 4.233 |
| Without partner | 100 | 47.2 | 61 | 61.0 | | | 1.0 | |
| Years of schooling (years) | | | | | | | | |
| Less than 8 | 107 | 65.2 | 69 | 64.5 | | | 1.0 | |
| 8 or more | 57 | 34.8 | 42 | 73.7 | 0.536 | 0.393 | 1.709 | 0.500 – 5.842 |
| Number of pregnancies | | | | | | | | |
| One | 56 | 24.9 | 29 | 51.8 | | | 1.0 | |
| Two | 47 | 20.9 | 33 | 70.2 | 0.685 | 0.338 | 1.98 | 0.489 – 8.042 |
| Three | 43 | 19.1 | 38 | 88.4 | 2.455 | 0.041 | 4.64 | 1.811 – 12.072 |
| Four or more | 79 | 35.1 | 50 | 63.3 | 2.921 | 0.022 | 2.14 | 1.242 – 5.422 |
| Time of the diagnosis | | | | | | | | |
| 1º quarter | 72 | 28.3 | 38 | 52.8 | | | 1.0 | |
| Other | 182 | 71.7 | 124 | 76.5 | 0.177 | 0.784 | 1.48 | 1.072 – 2.028 |
| Coinfection | | | | | | | | |
| No | 213 | 83.9 | 142 | 66.7 | 1.984 | 0.003 | 3.87 | 1.954 – 9.413 |
| Yes | 41 | 16.1 | 20 | 48.8 | | | 1.00 | |

OR: *odds ratio*; 95%CI: 95% confidence interval; the final model parameters: $R^2$ = 0.392 (Hosmer and Lemeshow); 0.343 (Cox & Snell); 0.401 (Nagelkerke); $\chi^2$ model = 143.64.

## DISCUSSION

This research, which was developed at the HC-UFPR, identified an alarming proportion of cessation of the follow-up of the NB exposed to syphilis during pregnancy, with 63.8% (n = 162) of the follow-up cases. Cessation of the follow-up impacts the goals set for such children and the targets established by the MS. The HC-UFPR is considered for reference and counter-reference to the mother and the child at risk. Assistance to infectious diseases during pregnancy and to children exposed to congenital infections in Curitiba and region[26] has been carried out in Congenital Infections Clinic of the Pediatric Infectious Diseases Service of the HC-UFPR. In the case of CS, the primary concern is to investigate signs suggestive of CS, to detect neurological or other systems alterations, to validate the effectiveness of the treatment, to estimate the need for retreatment, and finally to confirm or not the VT.

It is worth noting that the HC-UFPR employs social service professionals who daily analyze the motives for the no-show and guide the patient on the reschedule of the medical appointment. If the patient is not found, an active search and visits of health agents are initiated by means of a partnership with the BHU of Curitiba. Medical appointments are also rescheduled by telephone, provided that the child is included in the system. However, all this effort does not translate into number of patients in the clinic.

In a study on child cognitive development in healthy Japanese in 2010, a proportion of 92.4% of cases with adherence to follow-up in children up to 18 months of age was recorded. Among the resources used in the study to retain the participants in the long term were communication to parents of the observations made by pediatricians; flexible medical appointments schedule, no waiting time on the medical appointments; free parking; photo album, gifts, and toys for children; and thank you, birthday, Christmas, and New Year cards. The few dropouts, motivated by the mother's return to work with change of address, constituted as an exception in this context[27].

Most research on the monitoring of chronic diseases in childhood, in general, does not show consistent adherence[28]. Williams et al.[29] followed children with HIV in the United States and Puerto Rico and found that the abandonment of the follow-up occurred when they began attending school and/or their mothers returned to work. However, in Ivory Coast, Anaky et al.[30] described the socioeconomic and cultural factors as responsible for the abandonment of follow-up in children infected with HIV. In Spain, families with very low socioeconomic and cultural levels showed high risk of dropping out the follow-up in children with very low birth weight at birth before two years[31]. In Indonesia, financial support and transportation for the children to go the health service were necessary to reduce the abandonment of follow-up of children with leukemia[32].

In some cases, factors such as the distance between the residence and the health service have influenced the continuity of follow-up. In Nigeria, for example, children with schizophrenia did not attend the medical appointments owing to the long

distances[33]. In our study, there was no statistically significant difference for the abandonment of the follow-up by mothers living in Curitiba, Paraná, or in the cities near the metropolitan region. However, the family health strategy, owing to the assistance close to the residence, can promote continuity of care to children exposed to syphilis during pregnancy.

Our research also found 65.2% of cases of gestational syphilis in women with less than eight years of schooling. However, maternal educational level has not configured a risk factor for the cessation of the follow-up.

The risk factors identified in this study that indicate greater probability of abandonment of the follow-up were maternal characteristics, such as age over 30 years, more than three children, and the absence of coinfection with HIV and viral hepatitis. The association of mothers with older ages with "Follow-up No" outcome was an unexpected finding, as it is assumed that mothers are more responsible and committed to childcare when they are more mature. However, such mothers consider themselves more experienced, with enough knowledge about the stages of development, and feel safer, neglecting the recommended follow-up. On the other hand, adolescent mothers may have more time available to attend the follow-up, as they may not yet be inserted in the labor market. Moreover, children often have the supervision of grandmothers in this role, demonstrating how family support is important.

It is expected that SGA, premature, or those NB without treatment would be prioritized by their mothers to attend the follow-up. In our study, there was no statistically significant difference when comparing the follow-up groups with these characteristics of the NB. Even in relation to the treatment of ten days or a single dose, no statistically significant difference was observed. An alarming finding was that 67.7% of the babies who did not undergo any treatment had the follow-up discontinued. These data corroborate the treatment at birth criteria established by MS. The recommended treatment has no significant side effects and, according to some authors, not treating the NB exposed to syphilis became an unethical conduct[31]. Owing to the high proportion of cases with discontinued follow-up, the current recommendations should be followed more strictly. This means that one should consider the high probability of the child not be taken to the appropriate follow-up, either by the mother or by the person responsible.

To ensure the follow-up of children exposed to syphilis during pregnancy, it is not enough to consider only the medical needs of the child, it is also necessary to meet the needs of the families. These findings reveal that monitor these children and develop strategies to promote the establishment of bonds with the families can improve the adherence to follow-up, and mainly provide multidisciplinary care when needed.

For women with other comorbidities, to monitor the health status beyond laboratory control is necessary. Owing to this fact, it is believed that mothers with other coinfections such as HIV and/or hepatitis should also carry out regular follow-up of their children.

## CONCLUSION

The follow-up of the NB exposed to syphilis during pregnancy is not in compliance with the goals recommended by the MS for this population, as the proportion of children exposed to syphilis who had the follow-up discontinued was 63.8%.

The factors associated with the abandonment of the follow-up were mothers aged over 30 years; mothers with three or more children; and absence of coinfection with HIV and/or viral hepatitis.

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## CORRECTION / *ERRATA*

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