

Outcomes in fetuses and newborns exposed to infections during pregnancy

Desfechos em fetos e recém-nascidos expostos a infecções na gravidez
Resultados en fetos y neonatos expuestos a infecciones en el embarazo

Kerolayne Aguiar Gomes da Silva¹

ORCID: 0000-0002-0473-3258

Keila Cristina Pereira do Nascimento Oliveira^{II}

ORCID: 0000-0003-0167-5889

Dara Moraes de Almeida¹

ORCID: 0000-0002-8744-010X

Edivânia dos Santos Sobrinha¹

ORCID: 0000-0002-2699-4643

Ewerton Amorim dos Santos¹

ORCID: 0000-0001-8453-017X

Géssyca Cavalcante de Melo¹

ORCID: 0000-0002-6774-857X

Raiany Samilli Pereira dos Santos¹

ORCID: 0000-0002-6424-9871

¹ Universidade Estadual de Ciências da Saúde de Alagoas.
Maceió, Alagoas, Brazil.

^{II} Universidade Federal de Alagoas. Maceió, Alagoas, Brazil.

How to cite this article:

Silva KAG, Oliveira KCPN, Almeida DM, Sobrinha ES, Santos EA, Melo GC, et al. Outcomes in fetuses and newborns exposed to infections during pregnancy. Rev Bras Enferm. 2021;74(3):e20200236. <https://doi.org/10.1590/0034-7167-2020-0236>

Corresponding author:

Kerolayne Aguiar Gomes da Silva
E-mail: enfkerolayneaguiar@gmail.com



EDITOR IN CHIEF: Antonio José de Almeida Filho
ASSOCIATE EDITOR: Ana Fátima Fernandes

Submission: 05-19-2020 **Approval:** 09-18-2020

ABSTRACT

Objective: To analyze outcomes in fetuses and newborns exposed to infections during pregnancy. **Methods:** Cross-sectional, quantitative study, carried out in a public maternity hospital in Maceió, Alagoas, Brazil. The sample consisted of 145 medical records of pregnant women admitted between 2015 and 2018 with possible vertically transmitted infections. Incomplete medical records or those that did not make it possible to describe fetal/neonatal exposure were excluded. The chi-squared test was used to verify the association between variables. **Results:** A greater occurrence of congenital syphilis was observed (28.8%). There was more than one outcome in the same individual, such as low birth weight (39%), respiratory distress (20.5%), oligohydramnios (20%), congenital malformation and small size for gestational age (10.8%). Maternal infections and the number of prenatal visits revealed an association with fetal/neonatal outcome ($p \leq 0.05$). **Conclusion:** The data obtained indicate the occurrence of unfavorable fetal/neonatal outcomes when related to neonatal infections and indicate the need for strategies that strengthen the coping with vertical transmissions. **Descriptors:** Infections; Pregnancy; Vertical Infectious Disease Transmission; Infant, Newborn; Obstetric Nursing.

RESUMO

Objetivo: Analisar desfechos em fetos e recém-nascidos expostos a infecções na gravidez. **Métodos:** Estudo transversal, quantitativo, realizado em uma maternidade pública, em Maceió, Alagoas, Brasil. A amostra foi composta por 145 prontuários de gestantes admitidas entre 2015 e 2018 com possíveis infecções de transmissão vertical. Foram excluídos prontuários incompletos ou que não possibilitaram descrever a exposição fetal/neonatal. Utilizou-se teste qui-quadrado para verificar a associação entre as variáveis. **Resultados:** Observou-se maior ocorrência da sífilis congênita (28,8%). Houve mais de um desfecho no mesmo indivíduo, como baixo peso ao nascimento (39%), desconforto respiratório (20,5%), oligodramnia (20%), malformação congênita e tamanho pequeno para idade gestacional (10,8%). As infecções maternas e o número de consultas pré-natal mostraram associação com o desfecho fetal/neonatal ($p \leq 0,05$). **Conclusão:** Os dados obtidos apontam a ocorrência de desfechos fetais/neonatais desfavoráveis quando relacionados a infecções neonatais e indicam a necessidade de estratégias que fortaleçam o enfrentamento das transmissões verticais. **Descritores:** Infecções; Gravidez; Transmissão Vertical de Doença Infecciosa; Recém-Nascido; Enfermagem Obstétrica.

RESUMEN

Objetivo: Analizar resultados en fetos y neonatos expuestos a infecciones en el embarazo. **Métodos:** Estudio transversal, cuantitativo, realizado en maternidad pública, en Maceió, Alagoas, Brasil. Muestra compuesta por 145 prontuarios de embarazadas admitidas entre 2015 y 2018 con posibles infecciones de trasmisión vertical. Excluidos prontuarios incompletos lo que no possibilitaron describir la exposición fetal/neonatal. Utilizó prueba chi-cuadrado para verificar la relación entre las variables. **Resultados:** Observó mayor ocurrencia de la sífilis congénita (28,8%). Hubo más de un resultado en el mismo individuo, como bajo peso al nacimiento (39%), dificultad respiratoria (20,5%), oligohidramnios (20%), malformación congénita y tamaño pequeño para edad gestacional (10,8%). Las infecciones maternas y el número de consultas prenatal mostraron relación con el resultado fetal/neonatal ($p \leq 0,05$). **Conclusión:** Los datos obtenidos apuntan ocurrencia de resultados fetales/neonatales desfavorables cuando relacionados a las infecciones neonatales e indican la necesidad de estrategias que fortalezcan el enfrentamiento a las transmisiones verticales. **Descriptor:** Infecciones; Embarazo; Transmisión Vertical de Enfermedad Infecciosa; Neonato; Enfermería Obstétrica.

INTRODUCTION

The occurrence of maternal and child complications caused by infectious agents is described by the Pan American Health Organization (PAHO) as being difficult to eliminate and prevent⁽¹⁾. Gradually, maternal and child mortality rates became public health indicators, with repercussions on the elaboration of several public policies in Brazil by the Ministry of Health (MH), aimed at this public⁽²⁻³⁾.

With regard to strategies for reducing maternal and child mortality, in 2011, the Rede Cegonha "Stork Network" (RC) was implemented and inserted into the Brazilian Unified Health System, locally referred to as SUS, corresponding to the current model of prenatal care in Brazil⁽³⁾. RC consists of a model of care that provides children with the right to safe birth and healthy growth and development, to guarantee access, reception, and resolution⁽²⁾.

Among the factors that can put the health of the binomial at risk we can mention the vertical transmission of infectious agents from the mother to the child, which can occur during pregnancy, childbirth, or after childbirth, via breastfeeding. The complications of infection include miscarriage, stillbirth, and severe malformations, with the occurrence of asymptomatic newborns (NBs) as well⁽⁴⁾. Among the main infections that can be transmitted vertically, are toxoplasmosis, rubella, cytomegalovirus, herpes simplex, syphilis, viral hepatitis B and C, the Zika virus (ZKV), and the acquired immunodeficiency syndrome (AIDS) through the human immunodeficiency viruses (HIV)⁽⁵⁾.

PAHO estimates that, every year, 2,100 children in Latin America and the Caribbean are born with HIV or contract it from their mothers, 22,400 are infected with syphilis, and an average of 6,000 acquire the hepatitis B virus. Countries in these regions have been working since 2010 to eliminate this which is considered a public health problem, the mother-to-child transmission of HIV and syphilis; for this, the Elimination of Mother-Child Transmission (EMCT) of HIV and congenital syphilis Strategy was used. This action implied a 55% reduction in new infections in children, from 4,700 to 2,100 cases between 2010 and 2015, preventing around 28,000 children from becoming infected with HIV in that period⁽⁶⁻⁷⁾. In 2017, data indicating the elimination of vertical transmission of HIV was reported by 20 countries and territories in the Americas, of which 7 received validation from the World Health Organization (WHO)⁽⁷⁾.

The infection by the human T-lymphotropic virus (HTLV) is through sexual intercourse and vertical transmission, enabling the occurrence of serious damage to the fetus and newborn⁽⁸⁾. HTLV is also associated with adult T-cell leukemia/lymphoma, tropical spastic paraparesis, and uveitis⁽⁹⁾. Despite the possible damage caused by the virus, screening for this infection has not yet been implemented in Brazil, which prevents the adoption of demonstrably effective strategies to prevent infection, such as effective prenatal care and abstinence from breastfeeding⁽⁸⁻⁹⁾.

Notifications of Zika virus infection cases in Brazil began in 2015, with about 0.5 to 1.5 million people infected, showing an increase in cases of microcephaly and Guillain Barré syndrome, a fact that led the WHO to declare the Zika virus as an international public health emergency in 2016. As early as 2017, there was a downward trend in ZKV infection in the Americas. However, despite the estimates showing a reduction in the number of cases, there were approximately 2,130 imported cases of travel

in Europe and about 5,500 imported cases of travel in the USA since the beginning of the Brazilian epidemic⁽¹⁰⁾.

In cases of absence of noticeable or nonspecific clinical manifestations, laboratory examination with serological tests are necessary during prenatal and neonatal screening to enable an early and specific diagnosis⁽⁴⁾. In some cases, direct molecular biology or microbiological exams are necessary, the most common being those using samples of amniotic fluid, umbilical cord blood, peripheral blood, cerebrospinal fluid, and urine⁽¹¹⁾.

Due to the wide possibility of infections that put fetal and neonatal health at risk, it is important to carry out investigations that identify their occurrence and outcomes so that they can be added to the existing literature and can serve as a subsidy in strengthening public policies, for planning strategies for monitoring women and partners, for family planning, and the involvement of health professionals in coping with vertical transmission of infections and infant morbidity and mortality⁽¹²⁾.

OBJECTIVES

Analyze outcomes in fetuses and newborns exposed to infections during pregnancy.

METHODS

Design, study location, and period

Cross-sectional study of a quantitative character based on the *Strengthening the Reporting of Observational Studies in Epidemiology* (STROBE) instrument and its tools⁽¹³⁾. The research was carried out in a public maternity hospital, located in the city of Maceió, Alagoas, Brazil, which is a reference in the care of high-risk pregnant women in the state. Data were collected between August 2018 and January 2019.

Population or sample; inclusion and exclusion criteria

A non-probabilistic sample was used as it was a sample composed of a specific group, medical records of pregnant women affected by infections that could be transmitted vertically (HIV, syphilis, hepatitis B and C, Zika virus, and toxoplasmosis), which were admitted to the Health Institution from 2015 to 2018. Initially, 219 medical records of pregnant women affected by these infections were selected. However, we excluded incomplete records and those that did not make it possible to describe fetal/neonatal exposure to vertical transmission, resulting in 145 valid records that composed the final sample.

Study protocol

Data collection occurred through the review of medical records and databases related to pregnant women in the Medical Records Archiving Sector (MRAS) of the study scenario. A structured questionnaire constructed by the authors was used with information regarding the obstetric history and the fetal and neonatal outcome after exposure to vertical transmission. The following variables were collected: gestational age, number of prenatal appointments, childbirth method, maternal infection, fetal sex, birth weight, and fetal/neonatal outcome.

Data analysis

The data were tabulated in Microsoft Office Excel spreadsheets, version 2013. For the descriptive and inferential analysis, the *Software Package for the Social Sciences (SPSS)* program, version 21 was used. The chi-squared test (χ^2) was used to verify the association between the variables. Among the associations made, we have the crossing of variables: number of prenatal appointments and fetal/neonatal outcome; and maternal infection and fetal/neonatal outcome. The results were exposed using absolute and relative frequency through tables. Results were considered significant when $p \leq 0.05$ for a 95% confidence interval.

RESULTS

The presentation of the results was divided into three topics: the first refers to the obstetric history of the fetuses born within the study scenario, with the description of the variables: gestational age, number of prenatal appointments, and childbirth method. The second topic describes the profile of fetuses and neonates exposed to infectious agents during pregnancy, with the following variables: fetal sex and birth weight. The third topic refers to fetal and neonatal outcomes after exposure to vertical transmission of infectious agents.

Obstetric history of the fetuses born in a Public Health Institution in Maceió, Alagoas, Brazil

Based on the obstetric history of the fetuses, it was observed that only 40% of deliveries were at term (37 to 42 weeks), with 56.5% occurrence of premature births (between 21 to 36 weeks). In addition, only 26.7% of pregnant women had between four and six prenatal appointments and most births occurred by cesarean section (60%) (Table 1).

Table 1 – Obstetric history of the fetuses born in a Public Health Institution in Maceió, Alagoas, Brasil, 2020 (n = 145)

Variable	Type	n	(%)
Gestational age	12 to 20 weeks	2	1.4
	21 to 36 weeks	82	56.5
	37 to 42 weeks	58	40
	Ignored	3	2.1
Number of prenatal appointments	None	21	14.5
	1 to 3 visits	30	20.7
	4 to 6 visits	39	26.9
	7 or more visits	30	20.7
Childbirth method	Ignored	25	17.2
	Vaginal	55	37.9
	Cesarean section	87	60
	Ignored	3	2.1

Fetal and neonatal clinical profile of individuals exposed to maternal infections during pregnancy

Regarding the profile of fetuses and neonates exposed to infectious agents during pregnancy, among the 145 pregnant women studied, 1 (n = 1) had twin pregnancy, totaling the sample of neonates to 146 (n = 146). The occurrence of 46.6% of female newborns and 26.7% with low birth weight (LBW), from 1,500 to 2,499 grams was identified (Table 2).

Table 2 – Fetal and neonatal clinical profile of individuals exposed to maternal infections during pregnancy in a Public Health Institution in Maceió, Alagoas, Brasil, 2020 (n = 146)

Variable	Type	n	(%)
Fetal sex	Female	68	46.6
	Male	66	45.2
	Ignored	12	8.2
Birth weight	Less than 500 g	1	0.7
	500 to 999 g	6	4.1
	1,000 to 1,499 g	12	8.2
	1,500 to 2,499 g	39	26.7
	2,500 to 3,999 g	70	47.9
	4,000 g and over	2	1.4
	Ignored	16	11

Fetal and neonatal outcomes after exposure to vertical transmission of infectious agents

Regarding fetal and neonatal outcomes after exposure to maternal infections, there was more than one complication in the same individual, which totaled 176 occurrences. The most prominent outcome was respiratory distress (20.5%), followed by oligohydramnios (20%), congenital malformation, and small size for gestational age (10.8%) (Table 3).

Table 3 – Fetal and neonatal outcomes in a Public Health Institution in Maceió, Alagoas, Brasil, 2020 (n = 176)

Variable	Type	n	(%)
Fetal/neonatal Outcome	Respiratory distress	36	20.5
	Oligohydramnios	35	20
	Congenital malformation	19	10.8
	Small size for gestational age	19	10.8
	Fetal death and at birth	18	10.2
	Intrauterine hypoxia	12	6.8
	Polyhydramnios	11	6.3
	Large size for gestational age	9	5.1
	Intrauterine growth restriction	8	4.5
	Perinatal hypoxia	3	1.7
	Intrauterine hypoxia	2	1.1
	Organ dysfunction	2	1.1
	Neonatal sepsis	2	1.1

Of the 145 pregnant women (n = 145) analyzed, there was a higher number of cases of maternal syphilis (68.3%), followed by HIV infection (12.4%), in addition to the occurrence of simultaneous HIV and syphilis infections (6.2%) and the onset of maternal Zika Virus infections (5.5%). On the other hand, analyzing the 146 neonates (n = 146), it was seen that, in addition to the clinical outcomes presented previously (Table 3), some NBs were diagnosed simultaneously with some congenital infections after birth. A higher occurrence of congenital syphilis (28.8%), HIV infection (0.7%) was observed, with 70.5% of fetuses and neonates not having an infection, and others, that were possibly exposed, did not obtain a laboratory diagnosis in relation to maternal infections (Table 4).

The chi-squared test showed a significant association between the variables "fetal/neonatal outcome" and "maternal infection" ($p = 0.012$). Among the 146 fetuses and neonates analyzed, 119 (81.5%) had unfavorable outcomes, with 88 (87.1%) of these complications associated with maternal syphilis.

Table 4 – Occurrence of maternal and congenital infections in a public maternity hospital in the state of Alagoas, Maceió, Alagoas, Brasil, 2020 (n = 146)

Variable	Type	n	(%)
Maternal infection	Syphilis	101	69.7
	Human immunodeficiency virus	18	12.4
	Human immunodeficiency virus + syphilis	9	6.2
	Zika virus	8	5.5
	Hepatitis B	6	4.1
	Hepatitis C	2	1.4
Congenital infection	Toxoplasmosis	1	0.7
	Syphilis	42	28.8
	Human immunodeficiency virus	1	0.7
	Uninfected or without laboratory diagnosis	103	70.5

The analysis of the variables “number of prenatal appointments” and “fetal/neonatal outcome” resulted in $p = 0.026$, indicating a significant association. Regarding the analysis of these variables, it could be inferred that, of the 121 fetuses and neonates analyzed, 26 (21.5%) were asymptomatic and, among these, 20 (29%) had their mothers accompanied in more than four prenatal appointments. On the other hand, 95 (78.5%) of the fetuses and neonates had complications, and 46 (88.5%) of these had their mothers assisted in less than four appointments. As they were not statistically relevant, the “ignored” data in the subcategory “number of prenatal consultations” were excluded (Table 5).

Table 5 – Association between the variables “maternal infection” and “fetal/neonatal outcome” and “number of prenatal appointments” and “fetal/neonatal complications” Maceió, Alagoas, Brasil, 2020

Variable	Category	Fetal/neonatal outcomes		p^{**}
		Yes (%)	No (%)	
Maternal Infection	Only syphilis	88 (87.1)	13 (12.9)	0.012
	Outros*	31 (68.9)	14 (31.1)	
Number of prenatal appointments	< 4 appointments	46 (88.5)	6 (11.5)	0.026
	≥ 4 appointments	49 (71)	20 (29)	

Note: * Simultaneous infections by HIV + syphilis, by HIV, hepatitis B and C, Zika virus and toxoplasmosis; **chi-squared (χ^2).

DISCUSSION

The occurrence of premature births found in 56.5% of the analyzed cases may have been directly influenced by the history of maternal infection, since the presence of these pathogens in pregnancy can trigger premature labor⁽⁴⁻¹⁴⁾. This differs from another study carried out in the city of Niterói, Rio de Janeiro, Brazil, in which data were collected regarding high-risk pregnant women who had additional comorbidities other than the presence of infectious agents in the current pregnancy, with the observation that only 23.03% of them evolved with premature labor⁽¹⁵⁾.

Prematurity and low birth weight contribute to the increase in neonatal morbidity and mortality since the fragility and immaturity of these newborns can contribute to several types of diseases⁽¹⁶⁾. Among them, there is the syndrome of respiratory distress, physiological jaundice, intraventricular hemorrhage, and retinopathy of the premature infant. Comorbidities like these are associated with infections acquired by the mother and can impair child development⁽¹⁷⁻¹⁸⁾.

On the other hand, although it is established by the Ministry of Health of Brazil that a minimum of six consultations be performed during prenatal care, with the aim, among others, of early identification of risks and minimization of maternal and infant morbidity and mortality rates⁽¹⁹⁾, it is noted in this study that 26.9% were close to or within the minimum recommendation and attended between four to six appointments during prenatal care, these women in question being those who were affected by infections during pregnancy, which probably generated the need for a higher number of prenatal appointments for its management.

In this study, it was observed that most births occurred by cesarean section (60%). Corroborating these data, the WHO describes that Brazil is in second place among the countries with the highest number of cesarean sections in comparison to the total number of births⁽²⁰⁾.

The performance of cesarean sections without the correct indication is related to greater risks for maternal and child health, postpartum hemorrhages and infections, physiological jaundice, prematurity, and respiratory problems⁽²¹⁾. Thus, it is evident that the vaginal delivery route offers many benefits and advantages for both the pregnant woman and the newborn, the main one being the favor of the first skin-to-skin contact immediately after delivery. However, there are situations in which natural childbirth should not be indicated, as in cases where it can cause damage to the mother-child binomial⁽²²⁾.

The study showed the occurrence of 26.7% of newborns with low birth weight (LBW); in addition, there was a higher occurrence of LBW in children of mothers with syphilis. A study on syphilis conducted by Silveira (2017) in a tertiary hospital in Botocatu (São Paulo) showed similar results, in which it was noted that 24% of neonates showed insufficient weight⁽²³⁾. Another study carried out in Maringá (Paraná) found a lower rate, with 13.7% of cases of LBW in the analyzed sample⁽²⁴⁾.

Under analysis of the WHO estimates, the number of cases involving prematurity is increasing, with the occurrence of about 15 million premature births in the world annually, which is the main cause of LBW. About 60% to 80% of all neonatal deaths are primarily caused by LBW. Its global prevalence is 15.5%, equivalent to about 20 million LBW babies born each year, with 96.5% of them in developing countries⁽²⁵⁾.

It was also revealed that maternal infections are associated with fetal and neonatal outcomes, especially regarding maternal syphilis infection. This can be evidenced through the literature since syphilis infection is characterized as the second leading cause of preventable fetal death worldwide. In 2016, the WHO reported the occurrence of more than half a million (approximately 661 thousand) cases of congenital syphilis in the world, which resulted in more than 200 thousand stillborn and neonatal deaths⁽²⁶⁾.

Still, in Cabo, South Africa, a study analyzed 50 newborns with syphilis and showed that, of these, 68% required admission to the intensive care unit and 38% died; it was also found that 56% of mothers did not receive prenatal care due to lack of diagnosis and that 98% of them were treated inadequately⁽²⁷⁾.

When observing the occurrence of congenital syphilis in Latin America and the Caribbean, the percentage rates have doubled since 2010, with the occurrence of 10,850 new cases. In 2015, about 22,400 cases were reported. These data show that the

number of children born with congenital syphilis in the region (170 per 100,000 live births) triples the goal of eliminating the disease (50 per 100,000 live births)⁽¹⁾.

New PAHO estimates show that, in 661 thousand total cases of congenital syphilis, there were 355 thousand adverse results at birth, which represents a significant relationship between deaths and disease⁽²⁶⁾. In regions where syphilis is prevalent in pregnancy, about half the rate of stillbirths may have been caused exclusively by this infection⁽²⁸⁾, given that if a pregnant woman is infected and does not receive adequate early treatment for syphilis, she may transmit the infection to the fetus, generating fetal and neonatal complications, such as LBW, premature birth, abortion, and stillbirth⁽²⁶⁻²⁸⁾.

As found in this study, other research shows that, among cases of vertical transmission, congenital syphilis is more prevalent than any other infection, making it more common than congenital HIV infection⁽²⁵⁾. According to PAHO, progress in eliminating vertical transmission of HIV and syphilis has slowed in Latin America and the Caribbean. To reduce this number of vertical transmissions, countries need to reach at least 95% of pregnant women, through prenatal care, being tested, diagnosed, and receiving appropriate treatment⁽¹⁾.

A decline in HIV infection rates is seen in Spain: according to a study, between 1997 and 2015, 532 children were diagnosed with HIV, with 46.6% of children between 1997 and 2000, 30.8% between 2001 and 2005, 17.4% between 2006 to 2010, and 5.1% between 2011 to 2015. The rates of new perinatal HIV diagnoses decreased from 0.167 to 0.005 per 100 thousand inhabitants⁽²⁹⁾. Regarding the national scenario, studies bring estimates that show a reduction in the HIV infection rate by half in the last 20 years in Brazil, and currently there is an estimated number of 5 infections per 100,000 live births, which makes the country a promising candidate to achieve the World Health Organization's HIV elimination goals⁽³⁰⁾.

Although Brazil has not yet achieved the eradication of congenital infections by syphilis and HIV, it is noted that its elimination is possible, since, in 2015, around 18 countries and territories showed data compatible with this double elimination, Cuba being the first country in the world to be validated by the WHO for achieving elimination⁽¹⁾.

Furthermore, from the perspective of maternal Zika virus infection and the consequent vertical transmission of the infection, the literature shows the occurrence of high rates of microcephaly and other serious congenital anomalies in newborns. This can be seen in a study carried out in French Guiana, a country in South America, during the Zika virus epidemic, in which it was found that among the 291 exposed fetuses, there was vertical transmission in 26% of them, being significantly associated with serious adverse results⁽³¹⁾.

In another study that analyzed reports of newborns exposed to the Zika virus in countries in the Americas, including Brazil, Colombia, Ecuador, United States of America, French Guiana, Martinique, Polynesia, Puerto Rico, and Trinidad and Tobago, it was found that, among the 4,683 individuals analyzed, there was a prevalence

of cerebral calcification (42.6%), followed by ventriculomegaly (21.8%), joint abnormalities (13.2%), ocular abnormalities (4.2%), and microcephaly (3.9%)⁽³²⁾. Another study highlights that maternal infection during the first trimester of pregnancy is associated with an increased risk of congenital Zika virus syndrome, while an infection in late pregnancy appears to have fewer early fetal and neonatal consequences with nonspecific signs⁽³³⁾.

Study limitations

The possibility of inconsistency and incompleteness of certain records regarding vertical transmission and outcomes in neonates, common in studies that are based on secondary data, represent a limitation of this study. However, the size of the sample used and the information collected did not preclude the proposed objective.

Contributions to the field

This study aims to collaborate for the construction of knowledge in the area of nursing and health, in addition to enabling access to the number of cases of vertical transmission of infectious diseases in pregnancy and the outcome in fetuses and newborns in the investigated scenario. The results can serve as subsidies for the elaboration of health care action strategies for the mother-child binomial and for comprehensive and holistic care.

CONCLUSION

In this study, it was shown that maternal infections and the number of prenatal appointments are associated with fetal and neonatal outcomes. Regarding the infections to which the newborns were exposed, a greater occurrence of congenital syphilis was observed (28.8%). In the analysis of the outcomes, there was more than one complication in the same individual, with a higher occurrence of low birth weight (39%), respiratory distress (20.5%), oligohydramnios (20%), congenital malformation and small size for gestational age (10.8%), as well as fetal/neonatal death (10.2%).

The occurrence of infections in pregnancy at the time of delivery, especially syphilis, suggests the existence of gaps in prenatal care and indicates the need to propose new strategies to the health team with a look at a humanized reception, a minimum offer of routine exams recommended by the protocols, and a guarantee of the bond, treatment, and adequate follow-up for pregnant women and their partners. These measures can strengthen the fight against vertical transmissions and, consequently, contribute to the reduction of child morbidity and mortality.

FUNDING

Research Support Foundation of Alagoas States (FAPEAL).

REFERENCES

1. Organização Pan-Americana De Saúde (OPAS). Redução da transmissão materno-infantil de HIV e Sífilis desacelera na América Latina e no Caribe, alerta OPAS [Internet]. 2017 [cited 2020 Feb 24]. Available from: https://www.paho.org/bra/index.php?option=com_content&view=article&id=5425:reducao-da-transmissao-materno-infantil-de-hiv-e-sifilis-desacelera-na-america-latina-e-no-caribe-alerta-opas&Itemid=812

2. Ministério da Saúde (BR). Secretaria de vigilância em Saúde. Departamento de Doenças e Agravos não Transmissíveis e Promoção da Saúde. Uma análise da situação de saúde e os desafios para o alcance dos Objetivos de Desenvolvimento Sustentável [Internet]. Brasília (DF); 2018[cited 2020 Feb 24]. 23 p. Available from: http://tabnet.datasus.gov.br/cgi/sinasc/saude_brasil_2017_analise_situacao_saude_desafios_objetivos_desenvolvimento_sustentavel.pdf
3. Paiva DSBS, Nunes HHM, Moreira SFS, Ferreira MGS. Pré-natal de alto risco em um serviço de referência: perfil sociodemográfico e clínico. REAS/EJCH. 2018;11(2). <https://doi.org/10.25248/reas.e136.2019>
4. Ministério da Saúde (BR). Secretaria de Vigilância em Saúde. Departamento de Vigilância, prevenção e controle das infecções sexualmente transmissíveis, do HIV/AIDS e das hepatites virais. Protocolo clínico e diretrizes terapêuticas para prevenção da transmissão vertical de HIV, Sífilis e Hepatites Virais [Internet]. Brasília (DF); 2019[cited 2020 Feb 24]. Available from: <http://www.aids.gov.br/pt-br/pub/2015/protocolo-clinico-e-diretrizes-terapeuticas-para-prevencao-da-transmissao-vertical-de-hiv>
5. Sadler TW. Langman, embriologia médica. 13ª ed. Rio de Janeiro: Guanabara Koogan; 2016. 105-107 p.
6. Organização Pan-Americana de Saúde (OPAS). OPAS lança nova iniciativa para eliminar a transmissão materno-infantil de quatro doenças [Internet]. 2017 [cited 2020 Jul 27]. Available from: https://www.paho.org/bra/index.php?option=com_content&view=article&id=5475:opas-lanca-nova-iniciativa-para-eliminar-a-transmissao-materno-infantil-de-quatro-doencas&Itemid=812
7. Organização Pan-Americana da Saúde (OPAS). Países avançam em direção à eliminação da transmissão vertical do HIV, sífilis, hepatite B e doença de Chagas [Internet]. 2019 [cited 2020 Jul 27]. Available from: https://www.paho.org/bra/index.php?option=com_content&view=article&id=5936:paises-avancam-em-direcao-a-eliminacao-da-transmissao-vertical-do-hiv-sifilis-hepatite-b-e-doenca-de-chagas&Itemid=812
8. Rosadas C, Malik B, Taylor GP, Puccioni-Sohler M. Estimation of HTLV-1 vertical transmission cases in Brazil per annum. 2018. <https://doi.org/10.1371/journal.pntd.0006913>
9. Paiva AM, Assone T, Haziot MEJ. Risk factors associated with HTLV-1 vertical transmission in Brazil: longer breastfeeding, higher maternal proviral load and previous HTLV-1-infected offspring. 2018. <https://doi.org/10.038/s41598-018-25939-y>
10. Leonhard SE, Lant S, Jacobs BC, Smith AW, Ferreira MLB, Solomon T, et al. Zika virus infection in the returning traveller: what every neurologist should know. Pract Neurol. 2018;18(4):271-7. <https://doi.org/10.1136/practneurol-2017-001789>
11. Romanelli RMC, Carellos EVM, Lima MAF, Diniz LO, Carvalho AL, Wakabayashi EA, et al. Estudo transversal do perfil das infecções congênitas atendidas entre 2012 e 2014 em um centro de referência em Belo Horizonte, Minas Gerais. Rev Med Minas Gerais. 2016;26(2):7-16. <https://doi.org/10.5935/2238-3182.20160016>
12. Organização Pan-Americana de Saúde (OPAS). Organização Mundial da Saúde. Organização Pan-Americana da Saúde e Organização Mundial da Saúde incentiva países das Américas a reforçar vigilância de microcefalia e outras anomalias congênitas [Internet]. 2016 [cited 2020 Feb 24]. Available from: http://www.paho.org/bra/index.php?option=com_content&view=article&id=5012:opas-ms-insta-paises-dasamericas-a-reforcar-a-vigilancia-dos-defeitosde-nascimento-incluindo-microcefalia&Itemid=816
13. Malta M, Cardoso LO, Bastos FI, Magnanini MMF, Silva CMFP. Iniciativa STROBE: subsídios para a comunicação de estudos observacionais. Rev Saúde Pública. 2010; 44(3):59-65. <https://doi.org/10.1590/S0034-89102010000300021>
14. Mor G, Aldo P, Alvero AB. The unique immunological and microbial aspects of pregnancy. Nat Rev Immunol. 2017;17:469-82. <https://doi.org/10.1038/nri.2017.64>
15. Guerra JVV, Valette COS, Alves VH. Perfil sociodemográfico e de saúde de gestantes em um pré-natal de alto risco. Braz J Health Rev [Internet]. 2019 [cited 2020 Feb 24];2(1). Available from: <http://brazilianjournals.com/index.php/BJHR/article/view/911/787>
16. Pessoa TAD, Martins CBG, Lima FCA, Gaíva MAM. O crescimento e desenvolvimento frente à prematuridade e baixo peso ao nascer. Av Enferm. 2015;33(3):401-11. <https://doi.org/10.15446/av.enferm.v33n3.44425>
17. Oliveira LL, Gonçalves AC, Costa JSD, Bonilha ALL. Fatores maternos e neonatais relacionados com a prematuridade. Rev Esc Enferm USP. 2016;50(3):382-9. <https://doi.org/10.1590/S0080-623420160000400002>
18. Domingues RMSM, Leal MC. Incidência de sífilis congênita e fatores associados à transmissão vertical da sífilis: dados do estudo Nascer no Brasil. Cad Saúde Pública. 2016;32(6). <https://doi.org/10.1590/0102-311X00082415>
19. Ministério da Saúde (BR). Secretaria de atenção à saúde. Departamento de Atenção Básica. Cadernos de atenção básica nº 32. Atenção ao pré-natal de baixo risco [Internet]. Brasília (DF); 2012 [cited 2020 Feb 24]. 33 p. Available from: http://bvsmms.saude.gov.br/bvs/publicacoes/cadernos_atencao_basica_32_prenatal.pdf
20. Vicente AC, Lima AKBS, Lima CB. Parto cesáreo e parto normal: uma abordagem acerca de riscos e benefícios. Temas Saúde [Internet]. 2017 [cited 2020 Feb 24];17(4):24-35. Available from: <http://temasensaude.com/wp-content/uploads/2018/01/17402.pdf>
21. Riscado LC, Jannotti CB, Barbosa RHS. A decisão pela via de parto no Brasil: temas e tendências na produção da saúde coletiva. Texto Contexto Enferm. 2016;25(1). <https://doi.org/10.1590/0104-0707201600003570014>
22. Melo JCF, Davim RMB, Silva RRA. Vantagens e desvantagens do parto normal e cesariano: opinião de puérperas. Rev Pesqui: Cuid Fundam. 2015;7(4):3197-205. <https://doi.org/10.9789/2175-5361.2015.v7i4.3197-3205>
23. Silveira SLA. Estudo epidemiológico da sífilis congênita: na realidade de um hospital universitário terciário[Dissertação] [Internet]. Botucatu. Universidade Estadual Paulista Júlio de Mesquita Filho. 2017 [cited 2020 Jan 28]. Available from: https://repositorio.unesp.br/bitstream/handle/11449/148892/silveira_sla_me_bot.pdf?sequence=3&isAllowed=y

24. Padovani C, Oliveira RR, Pelloso SM. Sífilis na gestação: associação de características maternas e perinatais em uma região do sul do Brasil. *Rev Latino-Am Enfermagem*. 2018;26. <https://doi.org/10.1590/1518-8345.2305.3019>
 25. World Health Organization (WHO). Cuidado do recém-nascido pré-termo e com baixo peso ao nascer [Internet]. 2018 [cited 2020 Feb 24] Available from: https://www.who.int/maternal_child_adolescent/newborns/prematurity/en/
 26. Organização Pan-Americana De Saúde (OPAS). Organização Mundial da Saúde publica novas estimativas sobre sífilis congênita [Internet]. 2019 [cited 2020 Feb 24]. Available from: https://www.paho.org/bra/index.php?option=com_content&view=article&id=5879:organizacao-ao-mundial-da-saude-publica-novas-estimativas-sobre-sifilis-congenita&Itemid=812
 27. Pillay S, Tooke LJ. Symptomatic congenital syphilis in a tertiary neonatal unit in Cape Town, South Africa: high morbidity and mortality in a preventable disease. *S Afr Med J*. 2019;109(9):652-8. <https://doi.org/10.7196/SAMJ.2019.v109i9.13817>
 28. Cerqueira LRP, Monteiro DLM, Taquette SR, Rodrigues NCP, Trajano AJB, Souza FM, et al. The magnitude of syphilis: from prevalence to vertical transmission. *Rev Inst Med Trop São Paulo*. 2017;59. <https://doi.org/10.1590/s1678-9946201759078>
 29. Ory SJ, Ramos JT, Fortuny C, González-Tomé MI, Mellado MJ, Moreno D, et al. Sociodemographic changes and trends in the rates of new perinatal HIV diagnoses and transmission in Spain from 1997 to 2015. 2019;14(10). <https://doi.org/10.1371/journal.pone.0223536>
 30. Coelho AVC, Coelho HFC, Arraes LC, Crovell S. HIV-1 mother-to-child transmission in Brazil (1994-2016): a time series modeling. *Braz J Infect Dis*. 2019. <https://doi.org/10.1016/j.bjid.2019.06.012>
 31. Pomar L, Vouga M, Lambert V, Pomar C, Hcini N, Jolivet A, et al. Maternal-fetal transmission and adverse perinatal outcomes in pregnant women infected with Zika virus: prospective cohort study in French Guiana. 2018. <https://doi.org/10.1136/bmj.k4431>
 32. Nithiyantham SF, Badawi, A. Maternal infection with Zika virus and prevalence of congenital disorders in infants: systematic review and meta-analysis. *Can J Public Health*. 2019 638–648. <https://doi.org/10.17269/s41997-019-00215-2>
 33. Pomar L, Musso D, Malingier G, Vouga M, Panchaud A, Baud D. Zika virus during pregnancy: from maternal exposure to congenital Zika Virus Syndrome. *Prenatal Diag*. 2019. <https://doi.org/10.1002/pd.5446>
-