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Seroprevalence of infection by syphilis, HIV 1/2, toxoplasmosis, hepatitis B and hepatitis C in pregnant women assisted by the health service of Penedo-AL

Soroprevalência da infecção por sífilis, HIV 1/2, toxoplasmose, hepatite B e hepatite C em gestantes assistidas pelo serviço de saúde do município de Penedo-AL

Seroprevalencia de infección por sífilis, VIH 1/2, toxoplasmosis, hepatitis B y hepatitis C en mujeres embarazadas asistidas por el servicio de salud del municipio de Penedo-AL

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Natália Tenório de Mendonça Uchôa
ORCID: https://orcid.org/0000-0003-2172-9418
Universidade Estadual de Ciências da Saúde de Alagoas, Brazil
E-mail: nati_tenorio@hotmail.com
Renata Camila da Silva Rêgo
ORCID: https://orcid.org/0000-0001-7015-2489
Universidade Estadual de Ciências da Saúde de Alagoas, Brazil
E-mail: renatacs_rego@hotmail.com
Paulo Vitor Muniz Azevedo
ORCID: https://orcid.org/0000-0002-6974-9410
Centro Universitário Cesmac, Brazil
E-mail: victormuniz123@outlook.com
Thiago José Matos-Rocha
ORCID: https://orcid.org/0000-0001-5153-6583
Universidade Estadual de Ciências da Saúde de Alagoas, Brazil
E-mail: thiago.matos@uncisal.edu.br
Erlon Oliveira dos Santos
ORCID: https://orcid.org/0000-0001-8489-5240
Laboratório Municipal de Penedo, Brazil
E-mail: oliveiraerlon@gmail.com
Flaviana dos Santos Wanderley
ORCID: https://orcid.org/0000-0001-6922-4174
Universidade Estadual de Ciências da Saúde de Alagoas, Brazil
E-mail: flavianasw@hotmail.com

Abstract
Infections during pregnancy are frequent and can cause severe complications, affecting the maternal-fetal binomial. Prenatal care is a classic example of prevention. A cross-sectional study was conducted with pregnant women to analyze the results of the nontreponemal test for syphilis and serologies for HIV 1/2, toxoplasmosis (IgM and IgG), hepatitis B and hepatitis C. The prevalences found were 4.9% (20/408), 0.24% (1/408), 20.83% (85/408), 0.49% (2/408), respectively for syphilis, HIV ½, toxoplasmosis (IgG) and HBV. No case of infection by the hepatitis C virus and acute toxoplasmosis (IgM) has been identified. It was possible to observe a high prevalence of syphilis, while the remaining infections had low prevalence. Screening for these infections is extremely important for the early diagnosis and treatment of pregnant women, avoiding maternal-fetal transmission and enabling better strategic planning for the prevention and early treatment of pregnant women.
Keywords: Pregnancy; Prenatal care; Perinatal infection; Seroprevalence; Parasitic infectious diseases.

Resumo
Infecções durante a gestação são frequentes e podem gerar complicações graves, afetando o binômio materno-fetal. O pré-natal é um exemplo clássico de prevenção. Foi realizado um estudo transversal com gestantes para análise dos resultados do teste não treponêmico para sífilis e das sorologias para HIV 1/2, toxoplasmose (IgM e IgG), hepatite B e hepatite C. As prevalências encontradas foram 4,9% (20/408), 0,24% (1/408), 20,83% (85/408), 0,49% (2/408), respectivamente para sífilis, HIV ½, toxoplasmose (IgG) e HBV. Não foi identificado nenhum caso de infecção pelo vírus da hepatite C e toxoplasmose aguda (IgM). Foi possível observar uma alta prevalência nos casos de sífilis, enquanto, as demais infecções mantiveram-se com baixas prevalências. O rastreio dessas infecções é extremamente importante para o diagnóstico e tratamento precoce das gestantes, evitando a transmissão materno-fetal, possibilitando um melhor planejamento estratégico de prevenção e tratamento precoce das gestantes.
Palavras-chave: Gestação; Pré-natal; Infecção perinatal; Soroprevalência; Doenças infecto parasitárias.

Resumen
Las infecciones durante el embarazo son frecuentes y pueden generar complicaciones graves, afectando el binomio materno-fetal. La atención prenatal es un ejemplo clásico de prevención. Se realizó un estudio transversal con mujeres embarazadas para analizar los resultados de la prueba no treponémica de sífilis y serología del VIH 1/2, toxoplasmosis (IgM e IgG), hepatitis B y hepatitis C. Las prevalencias encontradas fueron de 4,9% (20/408), 0,24% (1/408), 20,83% (85/408), 0,49% (2/408), respectivamente para sífilis, VIH 1/2, toxoplasmosis (IgG) y VHB. No se identificó ningún caso de infección por el virus de la hepatitis C y toxoplasmosis aguda (IgM). Se pudo observar una alta prevalencia en casos de sífilis, mientras que las otras infecciones se mantuvieron con baja prevalencia. El cribado de estas infecciones es sumamente importante para el diagnóstico y tratamiento precoz de las mujeres embarazadas, evitando la transmisión materno-fetal, posibilitando una mejor planificación estratégica de la prevención y el tratamiento precoz de las gestantes.
Palabras clave: Gestación; Prenatal; Infección perinatal; Seroprevalencia; Enfermedades infecciosas parasitarias.

1. Introduction

Infections frequently occur during pregnancy. Depending on the type and when the infections occur they can cause severe complications, affecting the maternal-fetal binomial. Prenatal care is a classic example of prevention (Baumgarten et al. 2011). In Brazil, the Ministry of Health (MS) advises that serological screening tests should be performed for the following diseases: syphilis, hepatitis B, HIV 1/2 and toxoplasmosis (Brasil 2012). The Brazilian Federation of Gynecology and Obstetrics Associations) (BFGOA) proposes that pregnant women should also be screened for hepatitis C (Melo and Pires do Rio 2006). These infections are often asymptomatic among adults, and can result in severe consequences when contracted by the child during pregnancy. Performing screening tests during this period is the key to early identify and treat pregnant women with a risk of vertical transmission (Baumgarten et al. 2011).

Toxoplasmosis is caused by the *Toxoplasma gondii* protozoan. Congenital transmission is more frequent if the infection occurs during the third trimester of pregnancy, and is less frequent during the first trimester, with its severity inversely proportional. The main sequelae for the newborn are chorioretinitis, hydrocephalus and cerebral calcification (Zemene et al. 2012). Literature data shows that in Brazil, the seroprevalence of *T. gondii* IgM and IgG in pregnant women is 1.1% and 59%, respectively, in the state of Paraná (Erezin et al. 2013), 2.4% and 61.4% in Rio de Janeiro (Vilte et al. 2016), 3,4 % and 62% in São Paulo (Gonçalves et al. 2010), 0.36% and 68.5% in Aracaju (Inagaki et al.2014). Another disease that affects pregnant women is syphilis. Brazil is currently experiencing a syphilis epidemic, considered a major public health issue. Its prevalence ranges from 0.8 to 1.5% (Erezin et al. 2013; Vilte et al. 2016; Figueiro-filho et al. 2007). Congenital syphilis is due to the hematogenous spread of *Treponema pallidum* in the untreated or inadequately treated pregnant woman, via the transplacental route. About 40% of the cases of congenital syphilis transmission may cause spontaneous abortion, stillbirth and perinatal death (Secretaria de Estado da Saúde de São Paulo 2008). Syphilis is considered, in epidemiological terms, an indicator of the quality of prenatal care for a population (Pires et al. 2007; De lorenzi and Madi 2001), and it is relevant to ensure that all pregnant women may have access to decent prenatal care (Pires et al. 2007; Araújo et al. 2013; Caddy et al. 2011). Fair treatment of infected pregnant women is the best method of preventing congenital syphilis (Saraceni and Miranda 2012; Saloojee et al. 2004; Araújo et al. 2006).

Another major public health issue is the large number of pregnant women infected with the hepatitis B virus (HBV). Its seroprevalence ranges from 0.3 to 1.8% (Gonçalves et al. 2010; Figueiro-filho et al. 2007). Neonatal HBV infection is almost always asymptomatic and the disease evolution is insidious, which determines a higher risk of developing complications and greatly increasing morbidity and mortality (Chakravarti et al. 2005; Mast et al. 2005; Schrag et al. 2003). It is estimated that the risk of developing hepatocellular carcinoma in children infected by vertical transmission by HBV is about 200 times greater than that of the general population, which demonstrates the importance of prenatal diagnosis (Chakravarti et al. 2005). The infection by the hepatitis C virus (HCV) in pregnant women has a prevalence that ranges from 0.1 to 1.6% (Vilte et al. 2016; Figueiro-filho et al. 2007). Unlike HBV, vertical transmission by HCV is rare. Although pregnant women

with a high HCV viral load or co-infected with HIV have a higher risk of transmission (Connor et al. 1994). As for HIV, it is known that the failure to early detect its infection during prenatal care represents a missed opportunity for an effective intervention in the infected pregnant woman, as the diagnosis, during pregnancy, and performing appropriate measures can reduce vertical transmission from 25.5% to 0 to 2% (Miranda et al. 2009).

A wide screening of these infections during the prenatal period is key to act in order to avoid vertical transmission, minimizing damage to fetal health. In addition, due to the importance of knowing the prevalence of infectious diseases transmitted during pregnancy and the variations in the epidemiological profile over the years, this study evaluated the prevalence of these infections, in the perspective of being able to assist in the planning of preventive measures and public health policies.

2. Material and Methods

A cross-sectional study was performed with pregnant women, through data collection at the Municipal Laboratory of Penedo, in order to analyze the results of the non-treponemal test - Venereal Disease Research Laboratory test (VDRL - LABTEST) for syphilis and serologies for HIV 1/2 (Anti-HIV 1/2 - Bioclin), toxoplasmosis (IgM and IgG - BioMérieux VIDAS® Kit), hepatitis B (HbsAg and anti-Hbs - BioMérieux VIDAS® Kit), hepatitis C (Anti-HCV - antibody - Ortho Clinical Diagnostics Kit VITROS®). The confirmatory test for syphilis (Fta-abs) was performed in the pregnant woman with a positive VDRL test. Data on pregnant women who underwent laboratory tests in the period between May 2017 and April 2018 were analyzed. Other variables were also analyzed, such as: origin (rural or urban area), gestational age (1st trimester, 2nd trimester or 3rd trimester) and the age group of pregnant women. This study was approved by the Research Ethics Committee (REC) of the State University of Health Sciences of Alagoas, under number CAAE 89612318.0.0000.5011. Positive cases for toxoplasmosis were defined as pregnant women whose serology presented positive IgM antibody. Pregnant women who were reactive in both the VDRL and the serological test were considered positive for syphilis. As for hepatitis B, positive cases were those that presented the HbsAg antigen positive. Of the 415 selected pregnant women, 7 of them were excluded due to lack of information in the database. Statistical analyzes were performed using SPSS® 20.0. Chi-square and Fisher's exact tests were used to compare proportions and investigate associations, considering a significance level of $p < 0.05$.

3. Results

The prevalences found were 4.9% (20/408), 0.24% (1/408), 20.83% (85/408), 0.49% (2/408), respectively for syphilis, HIV ½, toxoplasmosis (IgG) and HBV. No case of infection by the hepatitis C virus and acute toxoplasmosis (IgM) has been identified. See Table 1.

Table 1: Prevalence of cases of syphilis, HIV 1/2, toxoplasmosis, hepatitis B and hepatitis C in pregnant women assisted by the health service of the city of Penedo-AL, between May 2017 and April 2018.

	Pregnant women	
Infections	**Positive**	%
Syphilis	20/408	4.9
Hepatitis B	2/408	0.49
Hepatitis C	0/408	0
HIV	1/408	0.24
Toxoplasmosis (IgM)	0/408	0
Toxoplasmosis (IgG)	85/408	28.83

Source: Authors.

Of the 408 pregnant women surveyed, 117 (28.67%) were between 13 and 19 years old, 197 (48.28%) between 20 and 29 years old and 94 (23.03%) between 30 and 45 years old, with a mean age of 24.4-year-old pregnant women (SD ± 6.59). When assessing the origin of the pregnant women - whether from urban areas or rural areas - it was not possible to identify any statistically significant association between the two variables - average age 24.9 years for pregnant women in rural areas and 24.3 years for pregnant women from the urban area. (95% CI 1.03-2.23; p = 0.4734). A higher prevalence was observed in syphilis cases among pregnant women aged 13-19 years and 20-29 years (8/20 - 40%, in both). There was a higher prevalence in the 20-29 age group for HIV 1/2 (1/1 - 100%), Hepatitis B (2/2 - 100%) and IgG toxoplasmosis (40/85 - 47%). There was no statistically significant association between age and seropositivity for these infections.

Regarding gestational age, there is a higher prevalence in the first pregnancy semester for syphilis (18/20 - 90%) and toxoplasmosis (81/85 - 95.3%). HIV 1/2 cases were higher in the second trimester (1/1 - 100%). HBV infection was diagnosed exclusively in the 3rd trimester (2/2 - 100%). In addition, for every infection there was a higher prevalence in pregnant women from the urban area. No statistically significant association was observed when comparing infections by gestational age and origin. The prevalence of each infection according to maternal age, gestational age and origin can be seen in Tables 2, 3, 4 and 5.

Table 2: Comparison of the proportions between the cases of syphilis and the maternal age, gestational age and origin of the pregnant women assisted by the health service in the city of Penedo-AL, between May 2017 and April 2018.

		Syphilis			
Variable	**Category**	**Positive n (%)**	**Negative n (%)**	**RP (IC 95%)**	***P -value***
Maternal age	13-19	8 (6.8)	109 (93.2)	1	
	20-29	8 (4.1)	189 (95.9)	1.68 (0.64-4.36)	0.279
	30-45	4 (4.3)	90 (95.7)	1.607 (0.49-5.17)	0.421
Gestational age	1st Trimester	18 (4.7)	368 (95.3)	1	
	2nd Trimester	1 (9.1)	10 (90.9)	0.51 (0.07-3.50)	0.498
	3rd Trimester	1 (9.1)	10 (90.9)	0.51 (0,07-3.50)	0.498
Origin	Rural Area	4 (5.2)	73 (94.8)	0.93 (0.32-2.70)	0.895
	Urban Area	16 (4.8)	315 (95.2)		

Source: Authors.

Table 3: Comparison of the proportions between the cases of hepatitis B and the maternal age, gestational age and origin of the pregnant women assisted by the health service in the city of Penedo-AL, between May 2017 and April 2018.

		Hepatite B			
Variable	**Category**	**Positive n (%)**	**Negative n (%)**	**RP (IC 95%)**	***P-value***
Maternal age	13-19	0	117 (100)	**1,00**	-
	20-29	2 (1)	195 (99)	1.01 (0.99-1.02)	0.531
	30-45	0	94 (100)	-	-
Gestational age	1st Trimester	0	386 (100)	1.00	-
	2nd Trimester	0	11 (100)	-	-
	3rd Trimester	2 (18.2)	9 (81.8)	**1.22 (0.92-1.61)	*0.001
Origin	Rural Area	0	77 (100)	**0.99 (0.98-1.00)	*1.000
	Urban Area	2 (0.6)	329 (99.4)		

*Fisher exact test. Source: Authors.

Table 4: Comparison of the proportions between HIV 1/2 infection and maternal age, gestational age and origin of pregnant women assisted by the health service in the city of Penedo-AL, between May 2017 and April 2018.

		HIV			
Variable	**Category**	**Positive n (%)**	**Negative n (%)**	**RP (IC 95%)**	***P-value***
Maternal age	13-19	0	117 (100)	1.00	-
	20-29	1 (0.5)	196 (99.5)	**1.00 (0.99-1.01)	*1.000
	30-45	0	94 (100)	-	-
Gestational age	1st Trimester	1 (0.3)	385 (99.7)	1.00	-
	2nd Trimester	0	11 (100)	**0.99 (0.99-1.00)	*1.000
	3rd Trimester	0	11 (100)	**0.99 (0.99-1.00)	*1.000
Origin	Rural Area	0	77 (100)	*1.000	-
	Urban Area	1 (0.3)	330 (99.7)		

* Fisher exact test. ** RP na categoria “Não”. Source: Authors.

Table 5: Comparison of the proportions between the cases of toxoplasmosis (IgG) and the maternal age, gestational age and origin of the pregnant women of the pregnant women assisted by the health service in the municipality of Penedo-AL, between May 2017 and April 2018**.**

		Toxoplasmose (IgG)			
Variable	**Category**	**Positive n (%)**	**Negative n (%)**	**RP (IC 95%)**	**P-value**
Maternal Age	13-19	30 (25.6)	87 (74.4)	1.00	-
	20-29	40 (20.3)	157 (79.7)	1.26 (0.83-1.91)	0.272
	30-45	15 (16)	79 (84)	1.60 (0.92-2.80)	0.088
Gestational age	1st Trimester	81 (21)	305 (79)	1.00	-
	2nd Trimester	3 (27.3)	8 (72.7)	0.769 (0.28-2.05)	0.615
	3rd Trimester	1 (9.1)	10 (90.9)	2.30 (0.35-15.10)	0.337
Origin	Rural Area	12 (15.6)	65 (84.4)	1.41 (0.81-2.47)	0.208
	Urban Area	73 (22.1)	258 (77.9)		

Source: Authors.

4. Discussion

It was noticed that 4.9% (20/408) of the pregnant women were reactive to the VDRL, as well as to the serological test. Currently, there is a great increase in the number of syphilis cases among pregnant women, including a large percentage of newborns affected by this infection. Some studies have shown low prevalence (Espírito Santo, 0.4% 22; Rio de Janeiro, 1.9% (Domingues et al. 2013); Amazonas, 1% (Machado Filho et al. 2010); Sergipe, 0.9% (Inagaki et al. 2009). A national hospital-based cohort study, performed in Brazil, from 2011 to 2012, with 23,894 puerperal women, showed a prevalence of 1.02% for cases of syphilis during pregnancy. Still in that same study, the prevalence of syphilis cases was analyzed considering the age group, with those between 20-34 years old being the most prevalent (Domingues et al. 2014), contrary to the data found in this study, which observed similar prevalences between 14-19 years old and 20-29 (40% in both). According to the ministry of health, in 2016, every state in the Northeast Region had detection rates for syphilis cases below the national average, with 37,436 pregnant women with positive syphilis serology found in Brazil, with 1% coming from the state of Alagoas (Brasil 2017a).

Although seroprevalence in syphilis cases in the present study was superior to other studies, that may be an evidence that there was a broader screening for syphilis in the studied population, instead of a real increase in the number of cases. In

addition, the detection of syphilis in many regions of the country is underreported. According to the Notifiable Diseases Information System, in 2016, several capitals in Brazil had incidence rates of congenital syphilis higher than the rates of syphilis detection in pregnant women, which leads to possible gaps in the diagnosis during pregnancy, acquired syphilis mistakenly notified and / or mistakes made by the epidemiological surveillance system in these cities (Brasil 2017). It is important to note that screening for syphilis cases during pregnancy is inexpensive and easy to access, usually being performed using the non-treponemic test (VDRL).

A high prevalence of HIV 1/2 infection was not found, which was already expected by the fact that the health units workers in the studied city regularly performs lectures on Sexually Transmitted Infections (STIs). The prevalence of HIV cases in this study was similar to that found by Figueiró-Filho et al. (2018) 28 (0.2%) and slightly higher than that found by Inagaki et al. (2009) 25 (0.14%), however lower than that found in a study conducted at a University Hospital in southern Brazil (2.9%). This can be explained by the fact that this last study was carried out in a University Hospital that is a reference in the region for the care of pregnant women with HIV (Gonçalves et al. 2016). A similar result (0.6%) was found in Miranda et al. (2009).

When analyzing the age group among the pregnant women surveyed, a higher prevalence was observed in those aged 20-29 years, corroborating with the Brazilian Epidemiological Bulletin of HIV / AIDS 2017, whose age group between 20 and 24 years was the one with higher numbers of HIV 1/2 pregnant women (28.4%) (Brasil 2017b). A study that analyzed the prevalence of HIV / AIDS in pregnant women in Alagoas, identified the maternal age between 20 to 29 years as the most prevalent (Silva et al. 2018), as well as in Sergipe, where the highest occurrence was between 20-34 years (Inagaki et al. 2009). These results show a probable increase in exposure and risk of infection in this age group, demonstrating the need to expanding access to information for these young women, instructing them on prevention measures.

Pregnant women with acute toxoplasmosis (IgM) infection were not identified. A study performed in Maranhão with 561 pregnant women showed 0.9% of pregnant women with active infection for toxoplasmosis (Camara et al. 2015). In Mato Grosso do Sul, 0.4% of pregnant women presented with anti-*T. gondii* IgM reagents (Figueiró-Filho et al. 2007). Despite the low prevalence of active infection by *T. gondii*, attention should be paid to the significant number of pregnant women susceptible to infection (79.1%) and transmitting the disease to the fetus. The prevalence of toxoplasmosis (IgG) was low (23.83%) comparing to the vast majority of Brazilian studies (Inagaki et al. 2009; Figueiró-Filho et al. 2007; Ferezin et al. 2013; Camara et al. 2015; Cantos, 2000; Varella et al. 2003), which showed a prevalence between 41% - 91%.

Regarding the age group, some studies (Inagaki et al. 2009; Ferezin et al. 2013; Varella et al. 2003) reported an increase in the prevalence of anti-*T. gondii* IgG with increasing age, differently from the current study, which observed a lower prevalence after 30 years (15%), being greater between 20 and 29 years.

As for hepatitis B, the prevalence found of 0.49%, corroborated with other studies: Perim et al. (2005) performed a study with 5,191 pregnant women, observing a prevalence of 0.5%; Kupek et al. (2012) detected, through a population-based study done from 2002 to 2007, a prevalence of 0.41%; Domingues et al. (2013) analyzed 1,534 pregnant women from 29 municipalities in Paraná, detecting a prevalence of 0.5%. These studies demonstrate that there is a low endemicity of HBV in Brazil. The two seropositive cases occurred in the 3rd gestational trimester, which may have been late diagnosed or may have occurred due to a recent infection.

Even though it has a low prevalence, the risk of developing hepatocellular carcinoma in children infected by HBV vertical transmission is about 200 times greater than the general population (Chakravarti et al. 2005), demonstrating the importance of prenatal diagnosis of this infection. There was no case of HCV infection among the pregnant women analyzed. Other studies (Pinto et al. 2011; Vilte et al. 2016) confirm the low prevalence of hepatitis C, which vary between 0.2-1.6%.

Despite the relatively low risk of vertical transmission, the lack of specific prophylactic proposals justifies routine screening for hepatitis C in pregnant women (Costa et al. 2009).

5. Conclusions

The infections surveyed were prevalent among pregnant women from the urban area as compared to those in the rural area. It is understood that other studies can be developed to better relate the possible risk factors present in the different populations. Although the sample was non-probabilistic, without showing statistical significance between its comparisons, there is a high prevalence for cases of syphilis, while the remaining infections remained with low prevalence. Screening for these infections is extremely important for the early diagnosis and treatment of pregnant women, avoiding maternal-fetal transmission, enabling better strategic planning for the prevention and early treatment of pregnant women. Although the sample was non-probabilistic, without showing statistical significance between its comparisons, there is a high prevalence for cases of syphilis, while the remaining infections remained with low prevalence. Screening for these infections is extremely important for the early diagnosis and treatment of pregnant women, avoiding maternal-fetal transmission, enabling better strategic planning for the prevention and early treatment of pregnant women.

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