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EPIDEMIOLOGICAL ASPECTS OF CONGENITAL SYPHILIS ASSOCIATED WITH MATERNAL EDUCATION

ASPECTOS EPIDEMIOLÓGICOS DA SÍFILIS CONGÊNITA ASSOCIADOS À ESCOLARIDADE MATERNA

ASPECTOS EPIDEMIOLÓGICOS DE LA SÍFILIS CONGÉNITA ASOCIADOS A LA ESCOLARIZACIÓN MATERNA

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ABSTRACT

Objective: to analyze epidemiological aspects of congenital syphilis associated with maternal education. **Method:** an exploratory study was conducted by means of analysis of retrospective data from the Notifiable Diseases Information System (SINAN) and the National Live Birth Information System (SINASC) in Aracaju, state of Sergipe, between 2008 and 2012. Data were analyzed in the statistical software SPSS 17.0. Pearson's chi-squared test (χ^2) was used and odd ratios were estimated through logistical regression. Data were presented in tables and a diagram and then compared with literature. **Results:** 318 cases of congenital syphilis were reported, with a high number of cases in children whose mothers had more than eight years of education ($n=186$). In most cases, sexual partners were not treated simultaneously with the pregnant women, who tended to have less than eight years of education. **Conclusion:** a high number of cases of congenital syphilis was reported in the period under study, with an association with less than eight years of maternal education, lower number of prenatal consultations and treatment of partners. **Descriptors:** Congenital Syphilis; Epidemiology; Public Health.

RESUMO

Objetivo: analisar aspectos epidemiológicos da sífilis congênita associados à escolaridade materna. **Método:** estudo exploratório feito por meio da análise de dados retrospectivos do Sistema de Informação de Agravos Notificados (SINAN) e do Sistema Nacional de Nascidos Vivos (SINASC), em Aracaju/SE, de 2008-2012. Os dados foram analisados no Programa Estatístico SPSS 17.0, utilizou-se o teste qui-quadrado de Pearson (χ^2) e estimadas as razões de chances pela regressão logística. Os dados foram apresentados em tabelas e uma figura, em seguida, discutidos com a literatura. **Resultados:** foram notificados 318 casos de sífilis congênita, com um elevado número de casos em crianças cujas mães apresentavam escolaridade superior a 8 anos ($n=186$). Foi verificada, majoritariamente, a não realização do tratamento do parceiro concomitante ao da gestante, e essa tende a apresentar escolaridade inferior a 8 anos. **Conclusão:** foi notificado um número elevado de SC, no período investigado, associada à escolaridade materna inferior a 8 anos, com um menor número de consulta pré-natal e de tratamento do parceiro. **Descritores:** Sífilis Congênita; Epidemiologia; Saúde Pública.

RESUMEN

Objetivo: analizar aspectos epidemiológicos de la sífilis congénita asociados a la escolarización materna. **Método:** estudio exploratorio, utilizando análisis de datos retrospectivos del Sistema de Informação de Agravos Notificados (SINAN) y Sistema Nacional de Nascidos Vivos (SINASC) en Aracaju/SE, de 2008-2012. Datos analizados con Programa Estadístico SPSS 17.0. Aplicado test Chi-cuadrado de Pearson (χ^2) y estimadas razones de oportunidad por regresión logística. Datos presentados en tablas y una figura, discutidos luego según la literatura. **Resultados:** fueron notificados 318 casos de sífilis congénita, con elevado número de casos en niños con madres de escolarización superior a 8 años ($n=186$). Verificada mayoritariamente la no realización del tratamiento del compañero conjuntamente con la embarazada, tendencia verificada en madres con escolarización inferior a 8 años. **Conclusión:** notificado elevado número de SC en el período investigado, asociado a escolarización materna inferior a 8 años, con menor número de consulta prenatal y tratamiento del compañero. **Descriptor:** Sífilis Congénita; Epidemiología; Salud Pública.

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INTRODUCTION

Despite being a very old disease, congenital syphilis (CS) is still a public health problem worldwide.¹ Among the various diseases that can be transmitted through the pregnancy cycle, syphilis has one of the highest rates of transmission.² Moreover, syphilis seriously harms both pregnancy and children, causing preterm births, stillbirths and neonatal deaths, for example. It frequently causes fetal hydrops and congenital infections in newborns.³⁻⁴

According to the World Health Organization, there are two million syphilis infections in pregnant women yearly with approximately 25% of the cases resulting in stillbirths or miscarriages and another 25% resulting in newborns with low birth weight or severe neonatal infection, with both problems associated with a higher risk for perinatal mortality.³

Congenital syphilis became a notifiable disease in 1986 to support epidemiological surveillance.⁵ It is one of the main causes of avoidable perinatal deaths, since it is easily preventable. However, neglect of preventive measures and lack of or inadequate prenatal care prevents diagnosis and early intervention plans, as well as the simultaneous treatment of mothers and partners.^{1,3,6} Syphilis is a sentinel event for healthcare quality because of its simple diagnosis and easy clinical and therapeutic treatment.¹

In the period between 1998 and June 2012, in Brazil, there were 80,041 cases of CS reported in the Notifiable Diseases Information System (SINAN, as per its acronym in Portuguese) for children aged under one year. The southeastern region reported 36,770 (45.9%) cases; the Northeast reported 25,133 (31.4%); the North reported 6,971 (8.7%); the South, 6,143 (7.7%), which is around five times less than the Northeast; and the Center-west reported 5,024 (6.3%) cases.⁷

The incidence of CS in Brazil in children under 1 year old in 2011 was 3.3 cases per 1,000 live births. In that year, 112 deaths were reported in the Mortality Information System (SIM, as per its acronym in Portuguese), which corresponds to a mortality coefficient of 3.9 per 100,000 live births.⁷

The state of Sergipe was among the three Brazilian states with the highest incidence of CS in 2011, with a rate of 6.7 cases per 1,000 live births.⁷ This problem, which involves social, political and economic factors, emphasizes the importance of this study, which can bring light to the epidemiological trajectory of this disease in the city of

Aracaju, in Sergipe. This study can also provide data to support managers in planning and executing prevention programs against the vertical transmission of the disease.

The objective of this study was to analyze epidemiological aspects of congenital syphilis associated with maternal education.

METHOD

A retrospective exploratory study was conducted between 2008 and 2012 in the city of Aracaju, which is the capital of the state of Sergipe, in the northeastern region of Brazil. The city has a primary health network with 43 Family Health Units (FHUs), which offer medical and nursing consultations in a setting that is close to pregnant patients' homes. Although prenatal care reaches a high number of patients, the authors found that social-economical inequalities, demographic aspects and behavioral risk factors are still important factors associated with inadequate prenatal care.⁸ The Ministry of Health recommends that pregnant women undergo at least six prenatal consultations. Moreover, FHUs promote educational activities that address maternal and child care.⁹

The study population involved all CS cases reported during the chosen period, including abortions and stillbirths, in children of mothers who lived in the city of Aracaju. Data were obtained from SINAN and from the National Live Birth Information System (SINASC, as per its acronym in Portuguese) in the city, referring to the period of 2008 to 2012.

SINASC, a countrywide information system under responsibility of municipal and state health secretariats, was established with the goal of studying the epidemiological profiles of live births.¹⁰ It is based on data obtained from live birth certificates, a standardized, official national document.¹¹

SINAN is a computer database managed by the Ministry of Health and its objective is to gather and process epidemiological data on notifiable diseases, enabling analysis of morbidity profiles and supporting decision making in the three government scopes.¹²

The variables employed in this study were: maternal skin color/race (white, black, brown, yellow), prenatal consultation (yes or no), adequate treatment (yes, no and did not receive), simultaneous treatment of partners (yes, no and unknown) and time of diagnosis of maternal syphilis (pregnancy, delivery/curettage and post-delivery/curettage). Age group (< 20 years and ≥ 20 years) and maternal education were

stratified (< 8 years and ≥ 8 years). All variables are found in SINAN's CS report sheets.

Data were stored in a databank in the software TabWin. The authors conducted an exploratory analysis, with simple and percentage measurement of frequency of the variables. Pearson's chi-squared test (X^2) was employed to verify associations among variables. To measure the intensity of risk factors, unadjusted (univariate models) and adjusted odd ratios (multivariate model) were estimated along with their respective confidence intervals through logistic

regression.¹³ Variables with $p < 0.05$ were considered significant.

Data were analyzed in the statistical software SPSS 17.0. Multiple correspondence analysis was employed to analyze the perceptual map using the significant results of the adjusted odds ratios.¹⁴

RESULTS

Between 2008 and 2012, there was a total of 318 reports of CS in the city of Aracaju. An increase in reports was noticed from 2008 (n=37) until 2012 (n=122) (Figure 1).

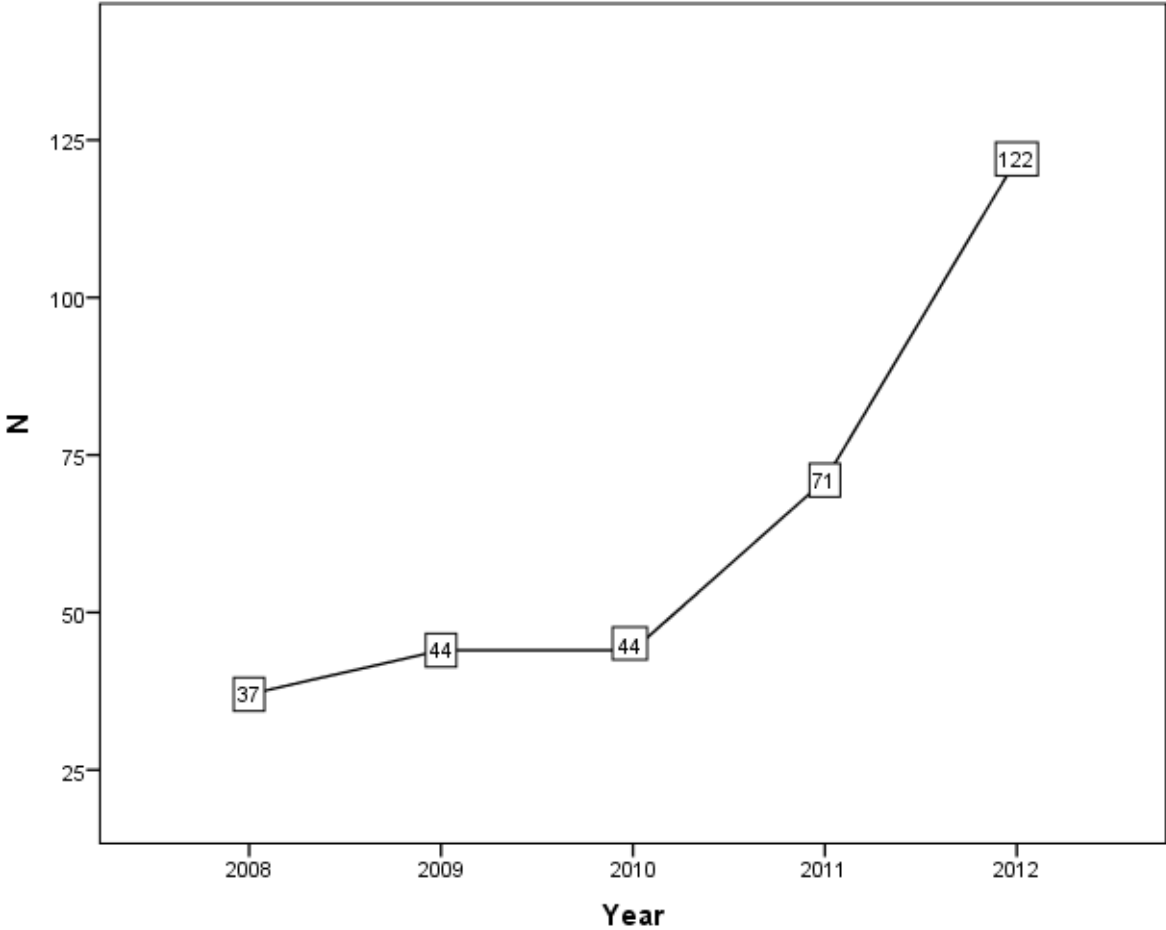


Figure 1. Distribution of reported cases of congenital syphilis, Aracaju, Sergipe, 2008 - 2012. Source: Sinan, Municipal Health Secretariat, Aracaju, Sergipe

Table 1 has an analysis of variables of cases of congenital syphilis related to sociodemographic aspects, comparing them to maternal education. The predominant age group among the study subjects was ≥ 20 years, with a total of 266 (84.7%) cases, with higher frequency among women with > 8 years

of education. Among mothers with more than eight years of education, 155 (82.9%) self-declared themselves as being brown.

The authors highlight that there are 43 (13.5%) pieces of unspecified data on the variable skin color/race.

Table 1. Sociodemographic aspects related to congenital syphilis. Aracaju, Sergipe, 2008-2012

Variables*	Education		Total n e 0%	p
	≤ 8 years n(%)	> 8 years n(%)		
Age group				0.603 (0.437)
< 20 years	22 (17)	26 (14)	48	
≥ 20 years	106 (83)	160 (86)	266	
Skin color/race				24.459 (<0.001)
White	8 (6.1)	4 (2.1)	12	
Brown	84 (64.1)	155 (82.9)	239	
Black	4 (3.1)	9 (4.8)	13	
Yellow	4 (3.1)	7 (3.7)	11	
Unknown	31 (23.7)	12 (6.4)	43	

Source: SINAN. Municipal Health Secretariat. Aracaju, Sergipe, 2008-2012.
*Numbers vary in each variable due to incomplete information.

Table 2 shows that 146 (48.2%) mothers did not undergo prenatal care and, of those, 71 (48.6%) had 8 years of education or less. Of all reported cases, only 6 mothers (1.9%) were adequately treated, and of those, 2 (33.3%) had more than 8 years of education. It was verified that 159 (50.8%) mothers were not

treated at all, 70 (44%) of them had more than 8 years of education. Moreover, 269 partners (84.6%) were not treated simultaneously with the mothers. A total of 231 mothers (73.5%) were diagnosed with syphilis only at the time of birth/curettage or after birth.

Table 2. Aspects related to prenatal care and syphilis treatment. Aracaju, Sergipe, 2008 - 2012

Education				
Variables*	≤ 8 years n (%)	> 8 years n (%)	Total n and %	p
Prenatal consultation (n=303)				8.20(0.004)
Yes	51 (32.5)	106 (67.5)	157	
No	71 (48.6)	75 (51.4)	146	
Adequate treatment (n=313)				1.359(0.507)
Yes	4 (66.7)	2 (33.3)	6	
No	92 (62.2)	56 (37.8)	148	
Not received	89 (56.0)	70 (44.0)	159	
Simultaneous treatment of pregnant women and partners (n=318)				4.217(0.121)
Yes	14 (42.4)	19 (57.6)	33	
No	164 (61.0)	105 (39.0)	269	
Unknown	9 (56.2)	7 (43.8)	16	
Time of diagnosis (n=314)				2.592(0.274)
Pregnancy	55 (66.3)	28 (33.7)	83	
Birth/curettage	115 (56.1)	90 (43.9)	205	
After birth/curettage	16 (61.5)	10 (38.5)	26	

Source: SINAN. Municipal Health Secretariat. Aracaju, Sergipe, 2008-2012.
*Numbers vary in each variable due to incomplete information.

Univariate analysis (table 3) shows that the variable brown skin color/race was related to a lower chance of having less than 8 years of education (OR: 0.36 IC: 0.22-0.62 p < 0.05) and unknown ethnicity was 4.52 (IC: 2.22-9.20 p<0.05) times more likely of having lower education.

Multivariate logistic regression (table 3) found that the chance of pregnant women having less than 8 years of education was

approximately 2 (IC: 1.25 -3.28, p: 0.004) times higher among those who did not attend prenatal consultations. In relation to lack of simultaneous treatment of partners, pregnant women were 2.48 (IC: 1.02- 4.42, p 0.013) times more likely of having less than 8 years of education.

Table 3. Odds ratios (OR) and corresponding confidence intervals (CI 95%) for maternal education associated with congenital syphilis, estimated through univariate and multivariate logistic regression models. Aracaju, Sergipe, 2008 - 2012.

Variables*	Unadjusted OR (CI Wald 95%)	P	Adjusted OR (CI Wald 95%)	P
Skin color/race*				
White	2.97 (0.87-10.10)	0.080	-	-
Brown	0.36 (0.22-0.62)	0.000	-	-
Black	0.62 (0.19-2.07)	0.439	-	-
Yellow	0.81 (0.23-2.82)	0.741	-	-
Unknown	4.52 (2.22-9.20)	0.000	-	-
Prenatal Consultation				
Yes	1(-)	-	1 (-)	-
No	1.97 (1.24-3.14)	0.04	2.03 (1.25-3.28)	0.004
Adequate treatment				
Yes	1(-)	-	-	-
No	1.22 (0.21-6.86)	0.82	-	-
Not received	1.57 (0.28-8.84)	0.60	-	-
Simultaneous treatment of pregnant women and partners				
Yes	1(-)	-	1(-)	-
No	2.12 (1.02-4.41)	0.44	2.48 (1.21-5.05)	0.013
Time of diagnosis				
Pregnancy	1(-)	-	-	-
Birth/curettage	1.54 (0.90-2.62)	0.113	-	-
After birth	1.23 (0.49-3.06)	0.659	-	-

Source: SINAN. Municipal Health Secretariat. Aracaju, Sergipe, 2008-2012.

*Reference category, individuals not included in skin color/race.

Figure 2 represents the perceptual map obtained from the analysis of multiple correspondence that shows a highlighted

result for the profile of mothers with less than 8 years of education, confirming the results of the multivariate logistic regression.

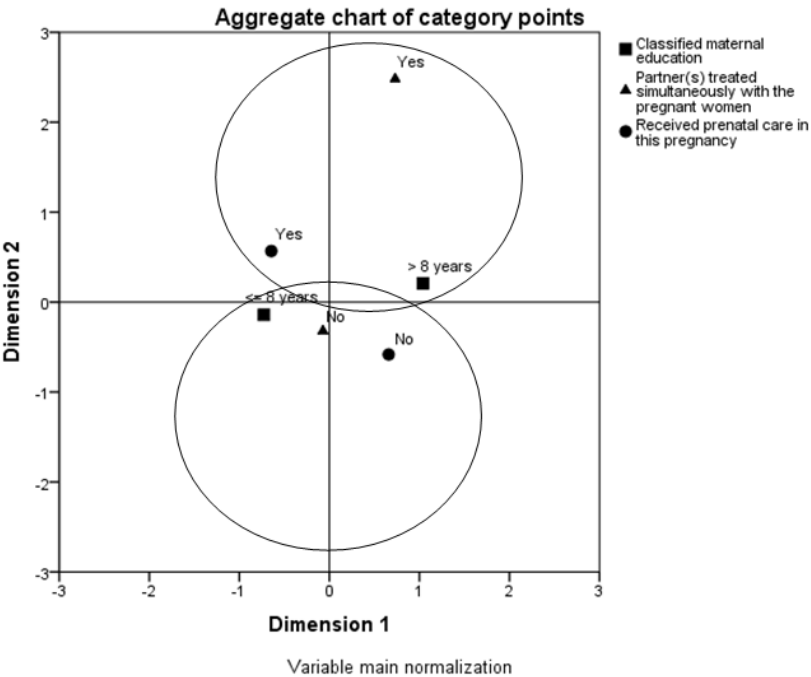


Figure 2. Perceptual map of the analysis of multiple correspondence related to maternal education associated with congenital syphilis. Aracaju, Sergipe, 2008 - 2012

DISCUSSION

High rates of CS were found in the city of Aracaju, with a total of 318 cases reported in the researched period. It is clear that incidence increases between 2008 and 2012, going from 3.9 to 13.1 new cases for 1,000 live births, respectively. In 2008, the same trend was found in 897 cities.¹⁵ These high numbers of cases are a result of low quality prenatal care. However, this fact can also be a result of increased notification.

A study conducted in 2015 with family health nurses in the city of Teresina, state of Paraíba, found professionals who were outdated when it came to conducting a VDRL test and approaching the subject’s partners, which shows the need for periodical training.¹⁶ A high number of cases (59.2%) was found in children whose mothers had more than 8 years of education. Thus, the authors conclude that congenital syphilis also occurs in children of mothers with such length of education. Congenital Syphilis has serious

consequences both for pregnancies and children, in addition to causing significant expenses to the health sector.^{1,3,4} In an epidemiological report on syphilis published in 2012, the state of Sergipe holds third place in the Brazilian ranking of the disease.⁷

Many demographical and behavioral risk factors are related to syphilis in pregnant women. The social demographic profile of mothers of newborns with CS was, predominantly, women at around 20 years of age, brown and with more than 8 years of education. This profile is very similar to that found in a study conducted in Belo Horizonte in 2013.¹⁰ Another study conducted in the state of Sergipe found a relationship between syphilis and age, with prevalence in the age group of 20 to 34 years.¹⁷ However, other studies found different results regarding maternal education above 8 years. In the countryside of the state of Rio Grande do Sul, in 2014, a study found that syphilis was associated with low education and absence of partners.¹⁸

Prenatal consultation follow-ups are considered an important tool for diagnosis and treatment of the disease, making the birth of a healthy newborn possible. The Ministry of Health recommends, at least, six prenatal consultations and the VDRL test in the first consultation and in the third trimester of pregnancy for early diagnosis and treatment of syphilis. VDRL corresponds to a nontreponemal serum test for the diagnosis of syphilis, presenting quantitative results expressed in titles. It is the test of choice for monitoring cases.^{3,7}

The national plan for fighting STDs/AIDS encouraged the adoption of rapid diagnostic tests as a strategy to improve and increase access to HIV and syphilis diagnoses. Rapid tests correspond to treponemal screening tests, which are very quick and easy to execute, using total blood samples collected through finger or venal puncture, presenting qualitative results in 10 to 15 minutes.^{7,19}

In this study, only more than half of the 318 pregnant women underwent prenatal consultations. Similar data were found in other studies, where congenital infections happened even though there were prenatal consultations.^{15,17} Possible explanations for this are related to low quality prenatal care, lack of exams, misinterpretation of results, difficulties recognizing the disease signs and problems in the mothers and/or partners' treatment.²⁰

Little more than half of the pregnant women in this study did not receive treatment and only 3.8% of them received adequate

treatment. The Ministry of Health determines that in order for the treatment of pregnant women with syphilis to be adequate, eliminating the possibility of vertical transmission, they have to receive benzathine penicillin in doses adjusted to their infection phase. In addition, partners have to be treated simultaneously with the same therapeutic framework, being monitored monthly, and treatment has to be completed 30 days before birth.⁹

This problem emphasizes the importance of early diagnosis and treatment of maternal syphilis, because late diagnoses increase the difficulty of finishing treatment in the adequate period for preventing vertical transmission of the disease. In this study, approximately three out of four pregnant women were diagnosed at the time of birth/curettage or after birth, when it is no longer possible to prevent the disease, since adequate treatment must be completed 30 prior to birth.²⁰

It was also found that most subjects (84.6%) did not have their partners treated, which is probably one of the main factors for therapeutic failure and consequent onset of the disease. These data agree with studies that found that the main factors for treatment failure is inadequate or lack of partner treatment, as well as late beginning of prenatal care and precarious diagnosis.²²⁻³ A study conducted in Campo Grande, in the state of Mato Grosso do Sul, in 2007 found that one of the main reasons for lack of success in partner treatment is related to the marital status of the infection carriers, who are mostly single women; partners' refusal to treatment; social issues; infidelity and health professionals' difficulties in addressing STD-related issues.¹⁷

According to the univariate analysis, brown subjects had lower chances of having less than 8 years of education, which differs from the study that claims that brown skin color is intrinsically related to less than 8 years of education.¹⁵ Unknown skin color/race presented an increased chance for having less than 8 years of education. However, it is worth noting that this variable's high rate of lack of information in the report sheets may indicate problems in the quality of records, as well as difficulties in skin color/race self-reporting.

In the multivariate analysis, subjects with less than 8 years of education had a higher tendency to avoid prenatal consultations, since individuals with low levels of education frequently ignore or see no value in prenatal care, which decreases the power of dialogue

with women. Thus, pregnant women with low levels of education have an increased chance to not having their partners treated. In general, most partners see no value in self-care and ignore the routes of infection and reinfection, not believing they are also responsible for this transmission.²²

This study presented some limitations related to the use of secondary data, such as underregistration and the possibility of undernotification, which is evidenced by record sheets filled inadequately, especially in the variable skin color/race, which presented a high quantity of ignored data. Moreover, there was low adherence to simultaneous treatment of partners and subjects. This is a worrying fact when considering the high percentage of inadequate treatment or lack of treatment. This causes the loss of opportunities for early diagnosis and treatment, since CS is a preventable disease and easily treated at low costs, which makes it a sentinel event.²³

A study conducted in Latin American and Caribbean countries showed that eliminating CS demands a high level of political commitment with support from the Ministry of Health.²⁴

CONCLUSION

The main strategies to reduce cases of CS are focused on early detection of infected pregnant women, improvement in prenatal care quality, training of professionals, implementation of rapid testing in health units and immediate beginning of treatment during pregnancy and treatment of the child after birth.

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