

Full Length Research Paper

Variables associated to anti-HIV, anti-rubella antibodies, syphilis reagins and enteroparasitosis in pregnant women

Graziela Vendrame Rodrigues¹, Karoline Franciani Cardoso Lopes¹, Isabel Cristina da Silva Caetano¹, Melissa Marchi Zaniolo¹, Francisco Hiroshi Matumoto², Luiz Sérgio Merlini¹, Fabiana Maria Ruiz Lopes-Mori³, Andréia Assunção Soares¹, Ulisses de Pádua Pereira⁴ and Daniela Dib Gonçalves^{1*}

¹Universidade Paranaense (UNIPAR), Umuarama, Paraná, Brazil.

²Clinical Laboratory, Universidade Paranaense (UNIPAR), Umuarama, Paraná, Brazil.

³Department of Preventive Veterinary Medicine and Public Health, University of Philadelphia (UNIFIL), Londrina, Paraná, Brazil.

⁴Universidade Estadual de Londrina (UEL), Londrina, Paraná, Brazil.

Received 30 March, 2017; Accepted 20 July, 2017

The aim of this paper is to determine the prevalence of anti-HIV, anti-rubella antibodies, syphilis reagins and enteroparasitosis in pregnant women during their pre-natal monitoring at the Basic Health Units in the city of Umuarama (PR) and checking possible social-economic and behavioral associations. A cross-section study was performed in 690 pregnant women who went to have pre-natal checkup in the period from June 2012 to April 2014. From the 690 pregnant women analyzed, 78 presented enteroparasites, and from these, 69 were monoparasited and nine were polyparasited, nine presented antibodies against syphilis and two against HIV. None was reagent for IgM regarding rubella. The most prevalent parasite species was *Endolimax nana* 43/78 followed by *Entamoeba coli* 33/78 and *Giardia duodenalis* 05/78. Regarding the variables analyzed, the ones associated to enteroparasitary infections were water treated from public suppliers, fundamental level of schooling, sewage destination and public collection of garbage. For syphilis, the variables associated to infection were per capita income and age group. For HIV and rubella, no association among the variables was observed. The number of pregnant women infected in the present study was not considered high when compared to other studies.

Key words: Pregnant women, prevalence, prevention, public health.

INTRODUCTION

Women who experienced metabolic, endocrinological and immunological changes during pregnancy, as such might be at greater risk of infections (Vieira, 2008). Infections during pregnancy present a great risk for both the mother and her fetus (Vieira, 2008). During antenatal

visits, pregnant individuals are examined for intestinal parasitosis, syphilis bacteria, rubella virus and human immunodeficiency virus (HIV). Of importance, the early diagnosis of these infections and early treatment can potentially minimize deleterious impacts to the newborn.

Enteroparasitosis is caused by the intestinal helminths and other protozoa, and approximately 3.5 billion people globally experienced enteroparasitosis (Belloto et al., 2011). Studies have shown that, during pregnancy, infection with intestinal parasites can result in intra-uterine growth. Furthermore, enteroparasitosis can contribute to anemia as well as deficiencies in iron, protein, folic acids and zinc, which can interfere with the course of pregnancy, leading to possible damages to the fetus (Macedo and Rey, 1996; Souza et al., 2002; Morales et al., 2006).

According to DATASUS (Department of Information Technology for the Brazilian Unified Health System), in Paraná (PR), from 2008 to 2012, a total of 772 cases of congenital syphilis were confirmed (REF). Such high prevalence reflects the mandatory need to examine such infection during pre-natal checks, ultimately reducing the possibility of transmitting *Treponema pallidum*, the etiologic agent of the disease to the newborn (Costa et al., 2013a). Furthermore, syphilis during pregnancy can lead to early and late complications including, fetal and neonatal death, prematurity, low birthweight, physical defects and neurologic damages (Rodrigues and Guimarães, 2004; Amorim and Melo, 2009).

Rubella, on the other hand, is a disease caused by a virus, belonging to the *Rubivirus* genus from the *Togaviridae* family (Costa et al., 2013b). When the fetus gets infected, high rates (up to 90%) of spontaneous abortion, stillbirth, congenital defects, vision problems, deafness, and heart and mental problems have been observed (Francisco et al., 2013). After vaccination was implemented, there was a reduction of 61.5% in the incidence of rubella, in the period from 1999 to 2001 ranging from 8.85 to 3.3 cases in every 100 thousand inhabitants (Francisco et al., 2013).

Finally, when considering HIV, 0 to 2.0% of pregnant women are carriers of the virus (Amorim and Melo, 2009). Critically, approximately 90% of the cases of HIV infection in people was acquired through vertical transmission (Carvalho and Piccinini, 2006) and therefore, the Brazilian government is dedicating itself to reduce the rate of vertical transmission of the Human Immunodeficiency Virus (Santos and Souza, 2012). When infected, the child usually presents unspecific symptoms, which includes deficiency in immunity that contributes to the child being vulnerable to opportunistic infections. Neurological changes due to HIV neurotropism in a brain that is not fully developed, may lead to the delay in neuro-psychomotor development, delay in language learning, mental deficiency, hyporeflexia and pyramidal syndrome (Manfredi et al., 2011).

Vertical transmission of etiologic agents (Human Immunodeficiency Virus (HIV), *Treponema pallidum*

(Syphilis) and *Togavirus* (Rubella), can take place during pregnancy and at the time of birth or during breastfeeding (Araujo et al., 2008; Amorim and Melo, 2009; Costa et al., 2013a, b). It is important to emphasize that in the case of enteroparasitosis, there is no transmission of the parasite but infected pregnant women experienced nutrient deficiencies that are necessary for the fetus (Vieira, 2008).

Considering the importance of these diseases and the damage they can cause to the newborn, it is necessary to diagnose infections during prenatal examinations. Thus, the objective of this study is to determine the prevalence of anti-HIV antibodies, anti-rubella, syphilis reagents and enteroparasitosis in pregnant women during prenatal monitoring in the Basic Health Units of the city of Umuarama (PR) and to verify possible economic and behavioral.

MATERIALS AND METHODS

Study location and sampling

The city of Umuarama is in the Northwestern region in the state of Paraná, Brazil (latitude 23°47' 55 South and longitude 53°18' 48 West), with 100676 inhabitants (IBGE, 2010).

To determine the size of the sample, an estimated number of 1,000 pregnant women/year seen at 23 Basic Health Units (UBS) in PR was used. For this study, the expected prevalence of 50, 5 error and 5% significance level ($p \leq 0.05$) were used, resulting in the minimum ideal number of 278 samples.

This research included pregnant women who agreed in signing the free and informed consent term (TCLE) and who had their prenatal in one of the 23 UBSS in Umuarama (PR), in any phase during their pregnancy. Blood and fecal collection were performed between June 2012 and May 2013, totaling 690 samples.

Laboratory examinations

Diagnostic tests were performed at the Clinical Analysis Laboratory of UNIPAR. For detection of *T. pallidum*, the samples were submitted to VDRL (Venereal Disease Research Laboratory) and in the presence of agglutination the sample was confirmed by Indirect Immunofluorescence Assay.

For detection of antibodies to rubella virus, serum samples were subjected to IgG and IgM antibody screening by chemiluminescence examination, with reagent IgM higher than 1.0 IU / mL and non-reactive IgM of less than 0.8 IU / ML, reagent IgG of greater than 20.0 IU / mL and non-reactive IgG of less than 10.0 IU / mL (ARCHITECT i2000sr®-Abbott, USA) according to the manufacturer's instructions.

For the HIV scan, a Rapid Immunochemography - HIV 1/2 3.0 strip test (Bioeasy, India) was performed according to the manufacturer's instructions and the reagent samples were confirmed by western blotting. Fecal samples were submitted to Spontaneous Sedimentation, and Centrifuge-fluctuation techniques for parasitological analysis (Hoffman et al., 1934; Faust et al., 1970).

*Corresponding author: E-mail: danieladib@prof.unipar.br. Tel: 44 3621 2828.

Table 1. Variables associated to the presence of enteroparasites in pregnant woman seen at the basic health units (UBS) in the city of Umuarama, Paraná, Brazil, 2012-2013.

Variable	Positivity Total (%)	P	OR (CI 95%)
Treated water from public supply			
No	9/39 (23.1)	0.023*	2.53 (1.07-5.85)
Yes	69/651 (10.6)	-	-
Schooling Level			
Basic	33/197 (16.8)	-	-
Secondary	40/412 (9.7)	0.011**	1.87 (1.11-3.16)
Tertiary	5/81(6.2)	0.032**	2.06 (1.08-9.30)
Public supplied sewage system			
No	39/263 (14.8)	0.030*	1.73 (1.05-2.85)
Yes	39/427(9.1)	-	-
Public collection of trash			
No	10/46 (21.7)	0.038*	2.35 (1.04-5.20)
Yes	68/644 (10.6)	-	-

p=probability; *Fisher's Exact Test; **Chi-square corrected by Yates (comparison between 1-2 and 1-3)
OR=Odds Ratio; CI=Confidence Interval.

Research instrument

For the detection of variables associated to the different infections, the pregnant women were interviewed. They answered an epidemiological questionnaire containing information on their age, marital status, number of pregnancies, profession, house, level of schooling, per capita income, origin of water consumed, destination of sewage and garbage, consumption of raw fruit and vegetables.

Statistical analysis

The information in the research instrument was stored and analyzed by the EpiInfo Program (Dean, 1996). The Fisher's exact test and the Chi-Square test corrected by Yates were used to verify the association among the variables studied, and the Odds Ratio (OR) was calculated to verify the intensity of associations among the four different infections and the variables studied. For all analyses, 5% significance level ($p \leq 0.05$) was used.

RESULTS

Fecal samples from 690 pregnant women were analyzed out of which, 78 (11.30%) samples were positive for enteroparasites. Among the 78 positive samples, 69 (88.46%) presented monoparasitism and 9 (11.54%) presented polyparasitism.

The most prevalent parasite species was *Endolimax nana* 43/78 (55.13%), followed by *Entamoeba coli* 33/78 (42.31%), *Giardia duodenalis* 5/78 (6.41%), *Enterobius vermicularis* 3/78 (3.85%), *Strongyloides stercoralis* 2/78 (2.56%) and *Ascaris lumbricoides* 01/78 (1.28%).

Regarding the other diseases, 9/690 (1.3%) pregnant

women presented antibodies against syphilis bacteria and 2/690 (0.30%) against the human immunodeficiency virus (HIV). Regarding rubella, 664/690 (96.20%) presented reactivity for IgG and no sample was reacting to IgM. Here, no pregnant woman analyzed presented co-infection, that is, infection by more than one disease, among the four diseases studied herein (Enteroparasitosis, Syphilis, Rubella and HIV). The positivity of pregnant women infected with the respective diseases was not very high when compared with other studies.

Regarding the variables analyzed, the variables associated to enteroparasitary infections were water treated from public suppliers ($p=0.023$), basic/secondary level of schooling ($p=0.011$); basic/tertiary level of schooling ($p=0.032$), sewage destination ($p=0.030$), and public collection of garbage ($p=0.038$). For syphilis, the variables associated to the infection were per capita income ($p=0.048$) and age group (up to 20/21-30: $p=0.010$; up to 20/older than 31; $p=0.022$). Regarding HIV and rubella, there were no significant associations with the variables analyzed (Tables 1 and 2).

DISCUSSION

In this study 813 pregnant women were involved, seen at the Basic Health Units in the city of Umuarama (PR). From these, only 690 (84.87%) were tested for four diseases which were researched in this study (enteroparasitosis, syphilis, HIV and rubella). Such

Table 2. Variables associated to the presence of syphilis in pregnant woman seen at the basic health units (UBS) in the city of Umuarama, Paraná, Brazil, 2012-2013.

Variable	Positivity Total (%)	P	OR (CI 95%)
Age group			
Until 20 years old	7/193 (3.6)	-	-
21 -30 years old	2/361 (0.6)	0.010**	6.76 (1.28 - 47.51)
Over 31 years old	0/136	0.022**	-
Income per capita			
≤350	6/237 (2.5)	0.048*	3.87 (0.96-15.65)
>350	3/451 (0.7)		

p=probability; *Fisher's Exact Test; ** Chi-square corrected by Yates (comparison between 1-2 and 1-3) OR=Odds Ratio; CI=Confidence Interval.

information raises concerns, since these pregnant women seem to be unaware of the importance of undergoing such exams. Such unawareness can be attributed to the lack of information on these pathologies, as well as the lack of guidance from local health professionals.

Regarding intestinal parasites, 78 (11.30%) of the 690 pregnant women analyzed were positive to the copro-parasitological tests performed in this study. This result is lower than those found in other states in Brazil, such as Pernambuco (PE), where Souza et al. (2002) found 37.00% positive pregnant women in the pre-natal outpatient clinic at the Instituto Materno Infantil (IMIP) and also in Rio de Janeiro (RJ), where Macedo and Rey (1996) found a prevalence of 37.60% in the pregnant women analyzed. The results of this study are also lower when compared to other countries in Latin America, since Alba et al. (2013) in Bolivia and Acurero et al. (2008) in Venezuela detected 22.52 and 65.90% respectively, of enteroparasites in pregnant women. The prevalence number is also lower when compared to countries in other continents, such as in Nigeria, where Adedoja et al. (2010) found a prevalence of 45.70% in pregnant women infected with intestinal parasites.

Among the several species found in this study, *E. nana* (55.13%), *E. coli* (42.31%) and *G. duodenalis* (6.41%) were the three most prevalent ones. When analyzing the three most frequent species, the results differ from the studies performed in the state of Pernambuco (PE), where the most frequent species found were *Entamoeba histolytica* (13.30%), *A. lumbricoides* (12.00%) and *Trichuris trichiura* (5.40%) (Souza et al., 2002). However, in Rio de Janeiro (RJ), the species detected were *A. lumbricoides* (15.50%), *E. coli* (9.00%) and *T. trichiura* (7.80%) (Macedo and Rey, 1996) and in São Paulo (SP), *A. lumbricoides* (19.00%), *Ancilostomidaeos* (16.70%) and *T. trichiura* (15.90%) (Guerra et al., 1991) were the most

prevalent ones. However, the results in this study regarding the prevalence of species are similar to the work by Alba et al. (2013) in Bolivia, who detected *E. histolytica* (15.30%), *E. coli* (15.30%) and *Giardia lamblia* (3.60%), and Acurero et al. (2008) in Venezuela, who detected *Blastocystis hominis* (48.30%), *E. nana* (25.00%) and *E. coli* (13.30%).

This difference in the number of infected pregnant women and also in the prevalent parasite species in the different studies and locations demonstrates the variation in relation to the deficit in education, basic sanitation and structure, as well as environmental and climate factors that might ease the survival and dissemination of parasites (Souza et al., 2002; Porta et al., 2014).

The two most prevalent species found in this study were *E. nana* and *E. coli*; two species that are not pathogenic for humans. However, their presence is a strong indicator of low hygiene-sanitary conditions, since the human infection by these parasites and pathogenic intestinal parasites is made by fecal-oral means (Duarte, 2011).

Regarding the variables associated to the enteroparasitary infection, the level of schooling (basic/secondary p= 0.011; basic/tertiary p=0.032) has been considered significant, showing that the prevalence of intestinal parasites is associated to the schooling level. By analyzing the results obtained, it could be observed that the presence of enteroparasitosis increases according to the decrease in schooling level, since 16.8% of pregnant women only with basic schooling were infected, while 9.7% of those women who had secondary schooling were also infected. Among those with tertiary education, only 6.2% were infected. These results are similar to the work by Souza et al. (2002) in Pernambuco (PE), who also noticed a decrease in the number of infected women according to the increase in the schooling levels.

Basic sanitation was also considered as an important variable associated to the infections. In the present study, 14.8% of the pregnant women interviewed did not have treated public sewage in their homes, and 23.10% of the houses of the pregnant women did not have treated water, which corroborated with the work developed in the city of Assis (SP), where Ludwig et al. (1999) found a decrease in the prevalence of intestinal parasitosis when water and sewage (basic sanitation) were treated in the houses of the pregnant women.

The public garbage collection variable (p=0.0038) was also associated to the enteroparasitary infection, which agrees to the work by Furtado and Melo (2011), who reported on the hygiene-sanitary conditions related to the high prevalence of intestinal parasitosis, with special attention to the inefficient garbage collection as an increase factor.

In relation to syphilis, 1.30% of the pregnant women presented antibodies against *Treponema pallidum*. The disease is described in several Brazilian states with

prevalence ranging from 0.20 to 6.00% (Brazil, 2012). This disease, when not detected and treated, can reach the fetus in 70 to 100% of the cases (Costa et al., 2013a). Bastos et al. (2013), in Carapicuíba (SP), detected 0.3% cases of congenital syphilis, and, according to the Ministry of Health (Brazil, 2013), between 1998 and 2012, a total of 80,041 cases of congenital syphilis in children with less than one year old were notified at SINAN (Notification Grievance Information System).

The results in this work are pivotal for the local health secretariat, since congenital syphilis is a disease that can easily be prevented when detected early in the pre-natal period and when the appropriate treatment is followed by the positive pregnant women. Thus, it is fundamental to identify and monitor this disease throughout the entire pregnancy, reducing the number of vertical transmission.

In this study, it was possible to detect two variables associated to the infection by *T. pallidum*. The age group variable (up to 20/ 21-30: $p=0.010$; up to 20/ older than 31: $p=0.022$) corroborates with the results by Figueiró-Filho et al. (2012) in Campo Grande (MS) and Costa et al. (2013a) in the state of Ceará (CE), who also observed this variable associated to the infection. In this study the most important fact is that, 7(3.60%) pregnant women aged up to 20 years presented antibodies against the syphilis virus, followed by the 21 to 30 years old age group, with two cases (0.60%). However, in pregnant women aged over 31 years, no positive cases were detected. Such situation shows the lack of knowledge and care in relation to the prevention and treatment of the disease in less experienced pregnant women, who, even in lower number (28.00%) than those aged between 21 and 30 (52.3%), presented the highest prevalence for this disease (Lima et al., 2013).

The *per capita* income variable ($p=0.048$) was also associated to the syphilis infection, with 6 (2.50%) infected pregnant women stating they had salary equal or lower than R\$ 350.00 per month.

Lima et al. (2013), studying congenital syphilis, states that this disease is present in greater proportion in low-income families. Such situation can be explained by the lower number of pre-natal consultations, insufficiency of resources for transportation to the laboratories and basic health units (UBS), and lack of financial support, and many others. Magalhães et al. (2013) also found that 80.6% of the pregnant women studied had family income of up to four minimum salaries, concluding that syphilis, even if not being a disease that is restricted to the least privileged classes, is related to the low social-economic level and therefore, public health policies must be implemented to help pregnant women in this sense.

Regarding rubella, the present work did not find any confirmed case of the disease during pregnancy, that is, no IgM positive results were found among the interviewed women. This result is similar to those found in other research, like in Ferenzin et al. (2012), there was no report of pregnant women in the northwestern region of

Paraná, and Inagaki et al. (2009), detected 0.10% of pregnant women infected in Sergipe (SE). However, it is important to emphasize that 26 (3.80) pregnant women were not immunized (presenting antibodies) against this disease. This situation can be explained in two reasons. The first is the non-seroconversion, since this vaccine presents an efficiency of 96.6 to 97%. Despite being a good efficiency, some people do not acquire immunity after vaccination (Candeias et al., 1977), and the second is the absence of vaccine. When question concerning vaccine arise, the pregnant women who were not immunized will reply by saying "we were not sure, if we had been vaccinated against rubella before the pregnancy". Such situation has already been described by Francisco et al. (2013), reporting the absence of information on vaccine status in 9.4% women (10 to 49 years old) interviewed in the city of Campinas (SP), noting a lack of guidance by the health teams before and during immunization on which vaccine is being given and its benefit to the population.

The non-detection of rubella in this study might be associated to the prevention campaigns developed against this disease, and the immunization of women in fertile age, a low-cost action with 97% effectiveness. These campaigns are promoted due to several manifestations (hearing, cardiovascular, neurological, among others) caused by the Congenital Rubella Syndrome (CRS) which generates high direct and indirect costs caused by the disease due to the chronicity and severity of the manifestations (Francisco et al., 2013).

Regarding HIV, this paper detected 0.30% of pregnant women infected. Such result is similar to work by Ferezin et al. (2012), in the Northeastern region of Paraná (PR), and Tavares et al. (2013) in the Federal District (GO), who detected a prevalence of 0.30 and 0.33%, respectively. Nonetheless, this was lower than the results found in the works of Vieira et al. (2011) in Vitória (ES) and Machado-Filho et al. (2010) in western Amazon (AM), who reported 0.44 and 0.60%, respectively. Most HIV vertical transmissions take place at the time of birth (65.00%) and the remaining (35.00%) happens during the last weeks of pregnancy.

Breastfeeding is also expressive (7.00 to 22.00%) in the transmission of this disease (Santos and Souza, 2012). As reported by Santos and Souza (2012), the earlier the diagnosis of maternal infection the better the prophylaxis results. Therefore, it is necessary that the anti-HIV test should be offered to all pregnant women at the beginning of their pre-natal evaluation.

It is pivotal that, all pregnant women have equal access to quality pre-natal programs during their entire pregnancy, and for one month after childbirth. These specific exams against diseases that might incur in damages to the newborn, especially the ones discussed herein (HIV, Syphilis, Rubella and Enteroparasitosis), as well as guidance from health professionals (doctors, nurses, biomedics, community health agents) regarding

the importance, consequences and adoption of preventive measures against the main congenital infections may lower these rates. This is the main reason behind the need of a training program for such health professionals.

Conclusion

When analyzing the prevalence of the four diseases researched, it could be noticed that when compared to other studies, these diseases did not present a high prevalence, which demonstrates a better preparation of the pregnant women and also to the local health agents regarding knowledge of the infections.

However, as long as there are infected pregnant women, solution must be made in preventing the diseases by the government. In this case, regarding to education and basic sanitation which were presented as variables with significant association in relation to syphilis and enteroparasitosis, diseases that are related to social-economic and behavioral factors, as well as basic sanitation is regarded to the results obtained in enteroparasitosis.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

ETHICAL ASPECTS

This project was approved in meeting of the Ethic Committee, in Research involving Human Beings (CEPEH) at Universidade Paranaense (UNIPAR) under protocol 329/985 from 7/September/2013 to Platform Brazil.

REFERENCES

- Acurero O, Díaz AI, Díaz AN, Bracho MA, Ferrer HM, Matheus MA (2008). Prevalence of enteroparasites in pregnant women "Dr. Armando Castillo Plaza" in Maracaibo. *Kasmera* 36(2):148-158.
- Adedoja A, Fadeyi A, Akanbi AA, Fabiyi JP, Nwabuisi C (2010). Prevalence of intestinal parasites among pregnant women attending antenatal clinic in a tertiary health institution in the Nigerian middle belt area. *Trop. J. Health Sci.* 17:1.
- Alba ELG, Hinojosa NB, Condarco ST, Andaluz VQ, Lopez AGS (2013). Prevalence of intestinal parasitosis in pregnant women at the Jaihuayco Health Center July-September 2012. *Rev. Cient. Cienc. Méd.* 16(1):28-31.
- Amorim MMR, Melo ASO (2009). Evaluation of routine prenatal exams (Part 1). *RBGO* 31(3):148-155.
- Araujo MAL, Silva DMA, Silva RM, Gonçalves MLC (2008). Analysis of the quality of the records in the records of pregnant women with VDRL reagent examination. *Rev APS.* 11(1):4-9.
- Bastos CJV, Oliveira GI, Rosemberg S, Zaragoza TR, Modenez SS (2013). Epidemiological study of syphilis in gestation at the hospital of the medical school of Centro Universitário São Camilo. *Arch. Health Investig.* 2(3):22-24.
- Belloto MVT, Junior JES, Macedo EA, Ponce A, Galisteu KJ, Castro E, Tauy LV, Rossit ARB, Machado RLD (2011). Enteroparasitoses in a population of schoolchildren in the public school system of the Municipality of Mirassol, São Paulo, Brazil. *Rev. Pan-Amaz. Saude.* 2(1):37-44.
- Brazil (2012). *Epidemiological Bulletin: Syphilis.* [cited 2014 Nov 3]. Available from: http://www.aids.gov.br/sites/default/files/anexos/publicacao/2012/52537/boletim_sifilis_2012_pdf_26676.pdf
- Brazil (2013). Brazil: Congenital syphilis - Confirmed cases reported in the Notification of Injury Information System - Sinan Net. [cited 2014 Sep 4]. Available from: <http://tabnet.datasus.gov.br/cgi/tabcgi.exe?sinanet/cnv/sifilisbr.def>.
- Candeias JAN, Rosenburg CP, Rácz ML (1997). Serological response of adults to rubella vaccination. *Rev. Saúde Pública.* 11:345-52.
- Carvalho FT, Piccinini CA (2006). Maternity in HIV infection: a study on the feelings of pregnant women. *Interact. Psychol.* 10(2):345-355.
- Costa CC, Freitas LV, Sousa DMN, Oliveira LL, Chagas ACMA, Lopes MVO, Damasceno AKC (2013a). Congenital syphilis in Ceará: epidemiological analysis of a decade. *Rev. Esc. Enferm USP.* 47(1):152-159.
- Costa FAS, AVM Square, Brandão AP, Rudder BAP, Carneiro BV, Brown DLM, Sfair LC, Rocha CHR (2013b). Congenital Rubella Syndrome: literature review. See *Med Saude Brasilia.* 2:46-57.
- Dean AG (1996). *Epi Info, Version 6: a word processing, data bases, and statistical program for public health on IBM-compatible microcomputers.* London: Brixton Books.
- Duarte PB (2011). *Microorganisms for fecal pollution in water resources [monograph on the Internet].* Belo Horizonte: Federal University of Minas Gerais. [cited 2014 Oct 5]. Available from: <https://docslide.com.br/documents/microrganismos-indicadores-55c9977b9196a.html>.
- Faust EC, Russell PF, Jung RC (1970). *Faust's Clinical Parasitology.* 8th Edition. Philadelphia: The Febiger.
- Ferezin RI, Bertolini DA, Demarchi IG (2012). Prevalence of positive serology for HIV, hepatitis B, toxoplasmosis and rubella in pregnant women in the northwest of Paraná. *Rev. Bras. Ginecol. Obstet.* 35(2):66-70.
- Figueiró-Filho EA, Freire SS, Souza BA, Aguenta GS, Maedo CM. Syphilis and Gestation: Comparative Study of Two Periods (2006 and 2011) in Puérperas Population (2012). *DST – J. Bras. Dis. Sex Trans.* 24(1):30-35.
- Francisco PMSB, Senicato C, Donalizio MR, Barros MBA (2013). Rubella vaccination in women of childbearing age in the Municipality of Campinas, São Paulo, Brazil. *Cad Public Health* 29(3):579-588.
- Furtado LFV, Melo ACFL (2011). Prevalence and epidemiological aspects of enteroparasitoses in the geronte population of Parnaíba, State of Piauí. *Rev. Soc. Bras. Med. Trop.* 44(4):513-515.
- Guerra EM, Vaz AJ, Toledo LAS, Ianoni SA, Quadros CMS, Dias RMDS, Barreto OCO (1991). Infections by helminths and intestinal protozoa in first-time pregnant women attended at state health centers in the Butantã Subdistrict, São Paulo City. *Rev. Inst. Med. Trop. Sao Paulo* 33(4):303-308.
- Hoffman WA, Pons JA, Janer JL (1934). The sedimentation concentration method in Schistosomiasis mansoni. *Int. J. Trop. Med. Public Health* 9:283-298.
- IBGE [Homepage on the Internet] (2010). Brazil: Brazilian Institute of Geography and Statistics. [cited 2013 Jan 10]. Available from: <http://cidades.ibge.gov.br/xtras/home.php>.
- Inagaki ADM, Oliveira LAR, Oliveira MFB, Santos RCS, Araújo RM, Alves JAB, Pinheiro KS, Gurge LRQ, Mussi-Pinhat MM (2009). Seroprevalence of antibodies to toxoplasmosis, rubella, cytomegalovirus, syphilis and HIV in sergipana pregnant women. *Rev. Soc. Bras. Med. Trop.* 42(5):532-536.
- Lima MG, Santos RFR, Barbosa GJA, Ribeiro GS (2013). Incidence and risk factors for congenital syphilis in Belo Horizonte, Minas Gerais, 2001-2008. *Cien. Saude Colet.* 18(2):499-506.
- Ludwig KM, Frei F, Alvares-Filho F, Ribeiro Ro-Paes JT (1999). Correlation between conditions of basic sanitation and intestinal parasitoses in the population of Assis, State of São Paulo. *Rev. Soc. Bras. Med. Trop.* 32(5):547-555.
- Macedo LMC, Rey L (1996). Enteroparasitoses in pregnant women and

- puerperal women in Rio de Janeiro. *Cad. Public Health* 12(3):383-388.
- Machado-Filho AC, Sardinha JFJ, Ponte RL, Costa EP, Silva SS, Espinosa FE (2010). Prevalence of HIV, HTLV, HBV and syphilis and chlamydia infection in pregnant women in a tertiary health unit in the Brazilian West Amazon. *Rev. Bras. Ginecol. Obstet.* 32(4):176-183.
- Magalhães DMS, Kawaguchi IAL, Dias A, Calderon IMP (2013). Maternal and congenital syphilis: still a challenge. *Cad. Saúde Publ.* 29(6):1109-1120.
- Manfredi AKS, Zuanetti PA, Mishima F, Granzotti RBG (2011). Neonatal auditory screening in newborns of HIV-positive mothers. *J. Soc. Bras. Fonoaudiol.* 23(4):376-380.
- Morales AJR, Barbella RA, Case C, Arria M, Ravelo M, Perez H, Urdaneta O, Gervasio G, Rubio N, Maldonado A, Aguilera Y, Vlloria A, Blanco JJ, Colina M, Hernández E, Araujo E, Cabanielg BJ, Rifakis P (2006). Intestinal Parasitic Infections Among Pregnant Women in Venezuela. *Infect Dis Obstet Gynecol.* 2006:1-5.
- Porta D, Gonçalves DD, Gerônimo E, Dias EH, Martins LA, Ribeiro LVP, Otutumi LK, Messa V, Gerbasí AV (2014). Parasites in synanthropic rodents in municipality of the Northwest region of the State of Paraná, Brazil. *Afr. J. Microbiol. Res.* 8:1684-1689.
- Rodrigues CS, Guimarães MDC (2004). Positivity for syphilis in postpartum women: still a challenge for Brazil. *Pan Am. J. Public Health* 16:168-175.
- Santos RCS, Souza MJA (2012). HIV in pregnancy. *Scientific station.* 2:11-24.
- Souza A, Ferreira LOC, Filho MB, Dias MRFS (2002). Enteroparasitoses, Anemia and Nutritional Status in Pregnant Women attended at Public Health Service. *RBGO* 24(4):253-259.
- Tavares LHLC, Silva O, Paz LC, Lopes LAB, Oliveira MLC (2013). Prevalence of hiv infection in parturients and coverage of the prenatal and delivery test in the Federal District, Brazil. *DST J. Bras. Dis. Sex Trans.* 25(2):82-87.
- Vieira ACBC, Miranda AE, Vargas PRM, Maciel ELN (2011). Prevalence of HIV in pregnant women and vertical transmission according to socioeconomic profile, Vitória, ES. *Rev. Saúde Publ.* 45(4):644-651.
- Vieira MAG (2008). Enteroparasitoses and iron deficiency anemia in assisted pregnant women in the unit of the Nova Viçosa family and possessions, in the municipality of Viçosa-MG [monograph on the Internet]. Viçosa: Federal University of Viçosa. [cited 2014 Oct 5]. Available from: <http://locus.ufv.br/bitstream/handle/123456789/4969/texto%20completo.pdf?sequence=1&isAllowed=y>.