Full Length Research Paper

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

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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 intrauterine growth. Furthermore, enteroparasitosis can contribute 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 carrier 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 Treponema pallidum (Syphilis) and Toxovirus (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 nutrients 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 106766 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 ≤ 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 (2000s®-Abbott, USA) according to the manufacturer’s instructions.

For the HIV scan, a Rapid Immunochromatography - 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).

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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 | 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.

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 poly parasitism.

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
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. 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 Acuero 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 prevalence 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 Ferezini 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 Platfform Brazil.

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