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Prevalence of Infectious Diseases in Pregnant Women in Franceville, GABON: Findings of Non-Malarial Infectious Diseases of Antenatal Care in Pregnant Women in Franceville, Gabon Study

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ABSTRACT

The clinical screening in antenatal care to prevent and treat infectious diseases in pregnant women is essential to saving maternal and newborn lives. Our research groups have been conducted studies in malaria and non-malarial infectious diseases in children and pregnant women. Here, we review the data from our recent research study on non-malarial infectious diseases of antenatal care in pregnant women in Franceville, Gabon. We conclude on high seropositivity levels of *T. gondi* and rubella virus infections. However, the prevalence of *T. pallidum* and HTLV-1 remains low among pregnant women, whereas HIV prevalence among young women was worried.

INTRODUCTION

In Sub-Saharan Africa, despite the improvement of health systems with the provision of vaccines, the use of antibiotics and the introduction of anti-retrovirals for HIV/AIDS treatments, infectious diseases are still a major cause of morbidity and mortality. Indeed, the prevalence and impact of non-malarial infectious diseases are rapidly increasing in the African population [1]. Among the target population, pregnant women and newborns are the most vulnerable groups. Indeed, during pregnancy, the immune system becomes very prone to infectious diseases [2,3] because of the immune and morphophysiological changes that the body undergoes to accept the fetus [4,5]. Several consequences of infectious diseases affecting pregnant women have also been associated with severe complications on the mother and the fetus that sometimes lead to deaths [6]. Indeed, the worldwide, under-five mortality was 6.3 million in 2013 [7,8] with the neonatal deaths accounted for 44% of all under-five mortality in year [9]. In Africa, the neonatal mortality rate (31 per 1000 live births) is almost 4-5 times higher than that of the Americas (8 per 1000 live births) and Europe (6 per 1000 live births) [9]. Among these infections, HIV, *Treponema pallidum, T. gondii*, the rubella virus and human T-cell lymphotropic virus type 1 require special interest in African countries.

In the world, 1.5 million pregnant women live with HIV in developing countries and 90% of them live in Africa [10]. HIV infection in pregnant women is responsible of premature birth, low birth weight, miscarriage or newborn mortality [11-14]. Although HIV transmission in utero rarely occurs because of anti-retroviral treatment during pregnancy, nevertheless, during delivery 65% of mothers transmit the virus to their child [15]. Note however that, progresses in the prevention of mother to child transmission of HIV-infection have substantially decreased the prevalence of pediatric HIV-infection and the burden of HIV attributable-childhood infectious diseases [16]. Nevertheless, the prevalence of HIV among pregnant women remains high in many African

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countries and there is an emerging recognition of higher morbidity and mortality among HIV-exposed uninfected than among HIV-unexposed young infants [17-19].

Despite the efforts made to eliminate syphilis, this disease still continues to be a cause of morbidity and mortality world widely [20,21]. Overall, an estimated 12 million people test positive for syphilis each year, of which over 2 million are pregnant women. In these pregnant women there are approximately 305 000 fetal and neonatal deaths every year and leave 215 000 infants at increased risk of dying from severe complications caused by this disease [22,23]. Indeed, syphilis during pregnancy has been associated with numerous adverse pregnancy outcomes such as perinatal death and disability, stillbirth, prematurity, low birth weight, neonatal mortality and congenital syphilis [24-26]. Also, it facilitates mother-to-child transmission of HIV [27,28].

Toxoplasma gondii is an obligate intracellular protozoan organism that can cause toxoplasmosis. Human are commonly infected by ingestion of raw or partly cooked meat containing Toxoplasma viable tissue cysts or by consumption of contaminated food and water with oocysts of *T. gondii*. It can also occur through placental transmission to the fetus [29].

Therefore, toxoplasmosis remains a major public health problem in the world. Indeed, it is estimated that about one third of the world's population is infected with *T. gondii* [30]. In Africa, the seroprevalence of *T. gondii* during pregnancy is generally as high as 80% [31,32]. Toxoplasmosis in pregnant women varies geographically. Also there are reports of 3.7% in Korea [33], 6.4% in South Africa [34], 17.3% in London [35], 24.1% in Saudi Arabia [33], 28.3% in Thailand [36], 30.9% in Tanzania [37], 68.6% in Brazil [38] and 92.5% in Ghana [39].

The *T. gondii* infection in pregnant woman may become severe disease, leading to the death. Among pregnant women acquired infection there is a wide variety of manifestations in the fetus and newborns, including spontaneous abortion, still-birth, newborn with hydrocephalus or microcephalus, cerebral calcifications and retinochoriditis. Those lead to mental retardation, blindness, epilepsy and death. The high prevalence of Toxoplasma infection and its severe consequences on the fetus and the infant shows the importance of pregnant women toxoplasmosis [40,41]. Thereby, toxoplasma antenatal screening is recommended to prevent this infection.

In sub-Sarahan Africa, the prevalence of natural anti-rubella antibodies ranges from 50% to 95% depending on age and geographical location [42,43]. Rubella virus remains an important pathogen worldwide, causing approximately 100 000 cases of congenital rubella syndrome every year [44,45]. Rubella has almost been eradicated by immunization programs in many developed countries, but outbreaks among unvaccinated individuals still occur [46]. The infection also continues to circulate in many countries with less effective immunization programs [47]. In some African countries, rubella seropositivity of 71-99% has been found in previous studies among women in their reproductive age, with countries like Mozambique (95%) and south Africa (97.5-98%) having highest incidence [48,49]. Rubella is a viral disease with complications including birth defects of the developing fetus, especially if the infection is acquired in the early months of pregnancy. It leads to abnormal fetal formation when it occurs in the first 11 weeks of gestation. Despite the severe consequences of rubella infection during early pregnancy, very little is known about the rubella seroprevalence in a number of African countries, Gabon in particular.

Among many human T-cell lymphotropic viruses (HTLV) described and designated, only HTLV-1 and 2 have been associated with human disease. Although the exact number of HTLV-infected individuals is not known, it is estimated that 15 to 20 million people in the world are infected by the virus [50]. HTLV-1 is endemic in the Caribbean, Japan, South America and regions of Africa [51,52]. HTLV-1 carriers develop associated diseases, with the adult T-cell leukemia/lymphoma and it associated myelopathy/tropical spastic paraparesis being the most severe. HTLV-1 infection causes significant morbidity and mortality. Others associations include uveitis, arthropathy and HTLV-1 associated infective dermatitis [53,54].

Despite pregnancy-relevant infections being an intensive field of research, their prevalence and possible co-infections among these women are rarely specified in some African countries. In Gabon, several data on pregnant women malaria and HIV infections are available. However, studies on prevalence of others infectious diseases among pregnant women attending antenatal care are unavailable. This report summarizes the results of our study on non-malarial infectious diseases of antenatal care in pregnant women in Franceville, Gabon [55].

FINDING

To evaluate the prevalence of non-malarial infectious diseases diagnosed during prenatal consultations of pregnant women in Franceville, the authors of this study included a total of 973 women aged 14 to 45 years from the two reference hospitals in that city, as well as the mothers and Child Health office and a private health center [55]. All women included after obtaining their written informed consent and performing the antenatal care at the different sites of the study. This study obtained ethical clearance from the ethic committee of Gabonese Health Ministry (MSP/MD/134/2008).

Table 1. Prevalence of infectious diseases and seronegativiity of rubella virus and *T. gondii*, by age geroups and social status.

Age group (yaers) n% (95 CI)					Social Status			
Prevalence	**(14-18) n=265**	**(19-25) n=300**	**(26-45) n=408**	**p-value**	**Worker n=79**	**Student n=143**	**Unemployed n=751**	**p-value**
HIV+ n=39/973 4.01% (3.79-4.23)	8 3.02 (2.86-3.18)	8 2.67 (2.54-2.80)	23 5.64 (5.32-3.96)	p=0.009	3 3.80 (2.60-4.01)	4 2.80 (2.65-2.94)	32 4.26 (4.03-4.49)	p=0.71
HTLV-1+ n=28/973 2.88% (2.73-3.03)	3 1.13 (1.10-1.15)	10 3.33 (3.16-3.50)	15 3.68 (3.48-3.88)	p=0.13	2 2.53 (2.41-2.65)	5 3.50 (3.31-3.69)	21 2.80 (2.66-2.94)	p=0.88
T. palladium+ n=24/973 2.5% (2.38-2.62)	2.64 (2.51-2.77)	1.33 (1.29-1.37)	3.19 (3.02-3.36)	p=0.29	3.80 (2.60-4.01)	0.70 (0.67-0.72)	2.66 (2.53-2.79)	p=0.29
Seronegativity	**(13-17) n=265**	**(18-24) n=300**	**(25-44) n=408**	**p-value**	**Worker n=79**	**Student n=143**	**Unemployed n=751**	**p-value**
T. gondii+ n=416/973 42.75% (40.10-45.40)	129 48.68 (45.65-51.71)	132 44.00 (41.26-46.74)	155 37.99 (35.64-40.34)	p=0.02	27 34.18 (32.06-36.30)	60 41.96 (39.36-44.57)	329 43.81 (41.08-46.53)	p=0.25
Rubella n=121/973 12.44% (11.68-13.20)	57 21.51 (20.49-22.82)	34 11.33 (10.65-12.01)	30 7.35 (6.91-7.79)	P<0.002	6 7.5 (7.15-8.03)	28 19.58 (18.39-20.77)	87 11.58 (10.88-12.60)	P<0.012

HIV+: Number of HIV-Positive Samples; HTLV-1+: Number of HTLV-1-Positive Samples; T. pallidum+: Number of T. pallidum-Positive Samples; n: number of Pregnant Women; CI: Confidence Interval

For the diagnosis of HIV, they used ELISA tests (Genscreen HIV-1/2 version 2, Biorad, France) and rapid tests (HIV/1/2 DetermineTM, USA). *T. pallidum* was diagnosed using serological tests (*Treponema pallidum* Hemagglutination Assay/Venereal Disease research Laboratory, BIOLAB South Africa). *T. pallidum* quantification was determined using Phosphorothionate, 2-butenoic acid-3-(diethoxyphosphinothioyl) methyl ester (RPR-II) nosticon flocculation tests. The diagnosis of rubella was made using the ELFA test (Vidas Biomerieux, France). For the *T. gondii* diagnosis, they used the VIDAS serological test (Biomerieux, France), IgG-avidity tests and the fluorescent enzyme-linked assay (ELFA) technique. Women who were positive for HIV and *T. pallidum* were referred for treatment according to the national health policies in Gabon. Their statistical analyses were conducted with Stat view 5.0 (SAS Institute, USA).

After confirmation of serological tests for the diagnosis of HIV, *T. pallidum*, rubella and HTLV-1; HIV prevalence remains high among 26-45 year olds (5.64%). This same observation was made with the prevalence of HTLV-1, which is high in this age group. In the case of syphilis, no difference in prevalence was observed between the different age groups. There was no significant difference between the prevalence of these infectious diseases (HIV: 4%; Syphilis: 2.5%. HTLV-1: 2.88%). In addition, these three infections were not associated with social status.

About seroprevalence of rubella virus and *T. gondii* by age group among pregnant women, the *T. gondii* seronegativity is higher (42.75%, n=416) than rubella's (12.44%, n=121; $p=7.4.10^{-30}$). The difference between *T. gondii* and rubella prevalence of seronegative women decreases with age (48.68%, 44.00%, 37.99% for rubella, 21.51%, 11.33%, 7.35% for *T. gondii*, for 14-18, 18-25 and 25-45 years, respectively). Nevertheless, the prevalence of rubella's seronegativity remains higher among the students group (19.58%, n=28) than among workers (7.59%, n=6/79) and unemployed groups (11.58%, n=87/751, p<0.01). On more time, social status was not associated with levels of *T. gondii* and rubella infections. However, a significant difference is observed between the prevalence of HIV and the seronegativity of *T. gondii* ($p=5.37.\ 10^{-91}$), but also between the prevalence of syphilis and the seronegativity of rubella ($p=3.78.\ 10^{-15}$).

During this study, no cases of triple infections were reported; however, some cases of co-infections were observed among some of these women. Indeed, there were two cases of HIV – *T. pallidum* co-infection and two other VIH – HTLV-1 cases. Only one case of *T. palladum* – HTLV-1 co-infection was observed. Similarly, twelve cases

of HIV infection and fifteen cases of HTLV-1 infection were found among *T. gondii* seronegative women. However, six women infected with HIV were also tested seronegative against rubella. Women tested seronegative both to *T. gondii* and rubella were either infected with HTLV-1 or HIV, about of two cases per group.

CONCLUSION

The level of circulation of infectious diseases remains high in Franceville. That calls to the reinforcement of antenatal care to improve mother and child health.

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