Original Research Article

Prevalence of Seropositive VDRL cases amongst pregnant women at the Rivers State University Teaching Hospital, Nigeria: Is routine screening for Syphilis using VDRL still relevant?

Abstract:

Background: Untreated maternal syphilis is strongly associated with adverse birth outcomes. The WHO recommends routine serological screening in pregnancy. Some workers have advised a reappraisal of this practice, having demonstrated low seroprevalence in their antenatal population.
Objective: To determine the prevalence of seropositive VDRL cases amongst pregnant women at the Rivers State University Teaching Hospital (RSUTH) in order to justify the need and cost-effectiveness for continued routine syphilis screening using VDRL alone.
Methodology: A retrospective review of hospital and laboratory records of all pregnant women booked for antenatal care (ANC) at RSUTH in a two-year period, from 1ST May 2017 to 30TH April 2019, was carried out. Data on patients' age, parity and educational level, and reactivity of VDRL test at booking were retrieved using structured pro-forma and analyzed using Epi Info Version 7. Test for significance using Chi-square was set at significant level of $P<0.05$.
Results: 3560 clinic patients had VDRL screening out of which 11 were positive. The overall prevalence rate in this study was 0.3%. The mean age was 31.5±4.7 years and the mean gestational age at booking was 22.1±6.8 weeks. There was no significant relationship between their Party (**$\chi 2 = 4.972$, p-value=0.083**) and Education (**$\chi 2 = 0.188$, p-value=0.910**) and seropositivity. However, age distribution and seropositivity was significant (**$\chi 2 = 13.240$, p-value=0.004**). The younger the patient below 29 years, the more likely a positive VDRL test. The cost of VDRL test per patient in RSUTH is $3, to detect the 11 cases the sum of $10,680 was spent.
Conclusion: The seroprevalence rate of syphilis in this study was low. Initial screening using VDRL alone is neither justified nor cost effective. Selective screening based on risk factors, like younger age, and specific test with TPHA is recommended.

Key Words: VDRL, Syphilis Screening, Prevalence, Determinants, Pregnancy, Rivers State,

Introduction:

Maternal syphilis is an important cause of adverse pregnancy outcome [1]. Syphilis, caused by infection with *Treponema Pallidum*, is a muco-cutaneous sexually transmitted infection (STI) with high infectivity in the early stages. It may also be passed trans-placentally to the baby from the ninth week of gestation onwards [2]. Untreated maternal syphilis is strongly associated with adverse birth outcomes including increased incidence of stillbirths, low birth weight and premature live births compared with uninfected women [3]. Congenital syphilis infection can result in serious complication in surviving newborns, including central nervous system abnormalities, deafness; multiple skin, bone and joint abnormalities; and haematological disorders [1].

The WHO recommend serological test for syphilis in pregnancy and treatment with injectable penicillin, including the partner, as a routine part of antenatal care [4]. Ideally this screening should be done in the first trimester or at first antenatal visit and again early in the third trimester. Syphilis screening and

treatment in the antenatal care is an effective way to reduce fetal and infant mortality and morbidity in the developing world.

The seropositive rate among pregnant women reported in Nigeria in the last five decades has been put at <3% [5] [6] [7] [8], while generally in Africa, the figure is in the range of 3%-18% [9] [10] [11]. While syphilis during pregnancy in the western world today is rare [12][13] largely due to effective antenatal screening, maternal syphilis remains a problem in many countries of sub-Saharan Africa [9][11]. In a previous retrospective study at our center over a ten-year period, 2004-2013, involving 12,971 patients, the prevalence was put at 7.28% [14]. No confirmatory test was done then, as it is not done now. That was quite some time ago and needs to be revalidated.

Most individuals with syphilis are asymptomatic or have transient lesions, and serological tests are often the preferred method for detection [15][16]. The VDRL test is a slide flocculation test employed in the diagnosis of syphilis and is the most widely used. The antigen used in this test is cardiolipin, which is a lipoidal extracted from beef heart, while the specific test is the Treponema Pallidum haemagglutination (TPHA) test. Any reactive VDRL test must be crosschecked with a specific treponemal test, Cardiolipin VDRL tests are not truly specific for syphilis. Antibody concentrations may be high in a large number of unrelated diseases, pregnancy and as a normal variant in some healthy people.

The TPHA is more sensitive than the VDRL in all but the primary syphilis and it is the most sensitive test of all for latent disease. These specific tests are not widely available in developing countries because they are laboratory dependent and require trained personnel; refrigeration for storage of reagents; and electricity to run its equipment [15][16]. Furthermore, the results might take days to weeks to be available.

The practice of universal antenatal screening for syphilis has been advised. Some workers have however advised a reappraisal of the practice having demonstrated low seroprevalence in their antenatal population. They questioned the cost effectiveness of this practice given its low yield [17][18].

This study therefore, seeks to determine the prevalence of seropositive VDRL cases amongst pregnant women at the RSUTH in order to justify the need and cost-effectiveness for continued routine syphilis screening using VDRL alone as practiced.

Methodology:

A retrospective, quantitative study of hospital and laboratory records of all pregnant women booked at the RSUTH for antenatal care in a two years period (1^{ST} May 2017 to 30^{TH} April 2019) was carried out. The study period of two years was chosen as it marked the period of conversion of the former Braithwaite Memorial Specialist Hospital (BMSH) to the RSUTH and is the expected period of child spacing, to limit duplication of cases.

Data on patients' age, parity and educational status and reactivity of VDRL test (positive or negative) at booking were retrieved using structured pro-forma. The case records of all seropositive cases were also followed up to determine fetal outcome at delivery, note was made of any stillbirth, prematurity, low birth weight, and gross CNS or musculoskeletal abnormality, usually included in the delivery summary notes.

The Age was categorized into ≤19 years, 20-29 years, 30-39 years and ≥40 years. The Parity was categorized into Nullipara (para 0). Multipara (para 1-4) and Grand Multipara (para ≥5).

All pregnant women who registered for antenatal care during the study period, consented to doing a VDRL test and their result entered in the laboratory records, were included and a formal sample size was not calculated. There were 3560 cases that met the stated criteria and formed the study population. Women with incomplete data were excluded.

Data were analyzed using United States CDC Epi Info Version 7. Data were summarized using frequencies and proportions for categorical variables; and means, standard deviation, medians and range employed for quantitative variables. The test of significance for the categorical and discrete variables was done using Chi-square at statistically significant level of $P<0.05$.

As the study involved review of existing MCH records, ethical approval, and a waiver for informed consent, was obtained from the Ethics and Research committee of the RSUTH.

The RSUTH is one of two tertiary hospital for referral from all private clinics, maternity homes, primary health centers and secondary health facilities from all the 23 Local government areas of Rivers State, Nigeria. The hospital is funded by the Government and patients are expected to pay directly for services (except few that participate in the National Health Insurance Scheme). It provides emergency obstetric services to women referred from other centers, as well as providing antenatal care and delivery services for low and high-risk pregnant women booked with the hospital. The hospital is well equipped and has round the clock availability of qualified team comprising of Obstetricians, Pediatricians and Anaesthetist. There is availability of laboratory and blood bank services in the hospital. Referrals are made directly from primary, as well as secondary, health facilities not following any pattern. The Department of Obstetrics and Gynaecology runs antenatal clinics Mondays through Fridays and about 2000 women book annually for ANC, with over 1500 deliveries per annum.

At the Laboratory, all serum samples, test antigens, and control samples were brought to room temperature (26^0C) and tested using the VDRL test kit, Rapid Diagnostics by DiaSpot© from Indonesia. A confirmatory test using TPHA for all positive VDRL sera is not routinely done in our setting. The cost of VDRL test per patient in RSUTH is N1000 naira, @ official conversion rate of N335 to $1, that is approximately $3.

Results:

During the study period, 3560 antenatal clinic patients had VDRL screening out of which 11 were positive. The overall prevalence rate in this study was 0.3%, declining from 0.5% in 2017 to 0.2% in 2018 (see table 1). The ages of the patients ranged from 15-48 years with a mean age of 31.5±4.7 years and a mean gestational age at booking of 22.1±6.8 weeks and the modal parity was 3. Table 2 and Figure 1 shows the distribution of sociodemographic characteristic of the clinic attendees.

Table 1: Prevalence of Positive VDRL cases among Clinic Attendees (n=3560):

Year	Positive (n/%)	Negative (n/%)	Total
2017	8 (0.5)	1750 (99.5)	1759
2018	3 (0.2)	1799 (99.8)	1802
Overall	**11 (0.3)**	**3549 (99.7)**	**3560**

Table 2: Socio-demographic Distribution of the clinic attendees (n=3560):

Characteristics	Frequency (N)	Percentage (%)
Age group		
≤19 years	42	1.2
20-29 years	1137	31.9
30-39 years	2216	62.2
40 years and above	165	4.6
Total	**3560**	**100.0**
Mean age and Standard deviation	**31.5±4.7**	
Parity		
Nullipara	1125	32.4
Multipara	2326	65.3
Grand multipara	79	2.2
Total	**3560**	**100.0**
Modal Parity = 3.		
Educational qualification		
Primary	58	1.6
Secondary	922	25.9
Tertiary	2580	72.5
Total	**3560**	**100.0**

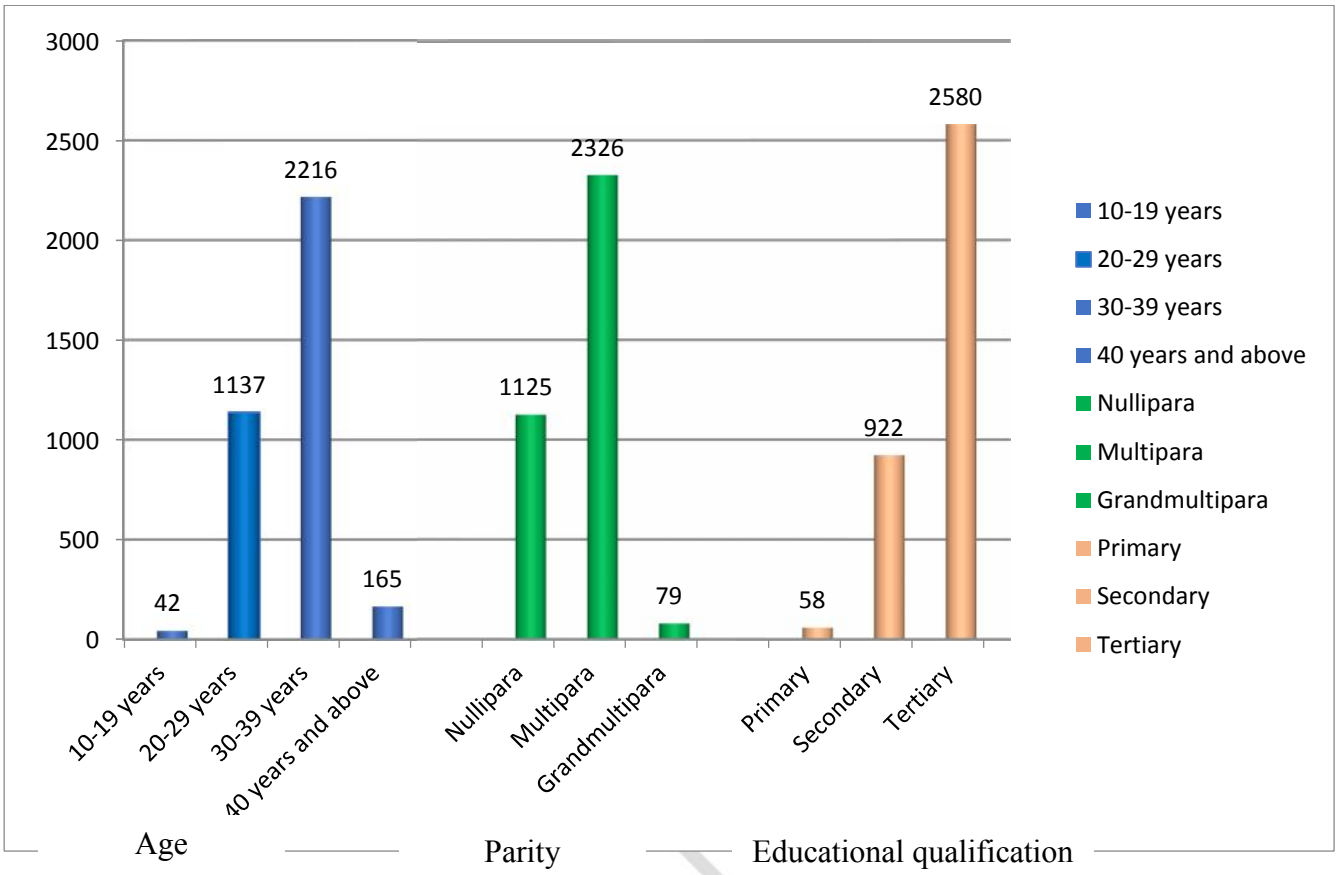

Figure 1: Distribution of Socio-Demographic characteristics of the attendees

The peak prevalence was recorded in the age group ≤19 years (2.4%) followed by 20-29 years (0.6%), indeed 8 of the 11 seropositive cases were seen in patients ≤29 years. Majority of the cases, 7 out of 11 were in Nullipara and 8 out of 11 in those with tertiary education (Figure 2 and Table 3). There was no documentation of treatment offered in all 11 cases; there was no specific or confirmatory test done on any of these patients; None of them had Stillbirth, premature delivery, low birth weight babies and their babies at delivery did not show any features of congenital syphilis.

Table 3 shows the Chi square analysis of the Socio-demographic characteristics and serum-reactivity of VDRL at booking of the antenatal clinic attendees at the RSUTH. There was no statistically significant relationship between their Party (**$\chi 2$ = 4.972, p-value=0.083**) and Educational Status ((**$\chi 2$ = 0.188, p-value=0.910**) and seropositivity at booking. However, age distribution and seropositivity was statistically significant (**$\chi 2$ = 13.240, p-value=0.004**). The younger the age of the patient below 29 years, the more likely the patient would have a positive VDRL test.

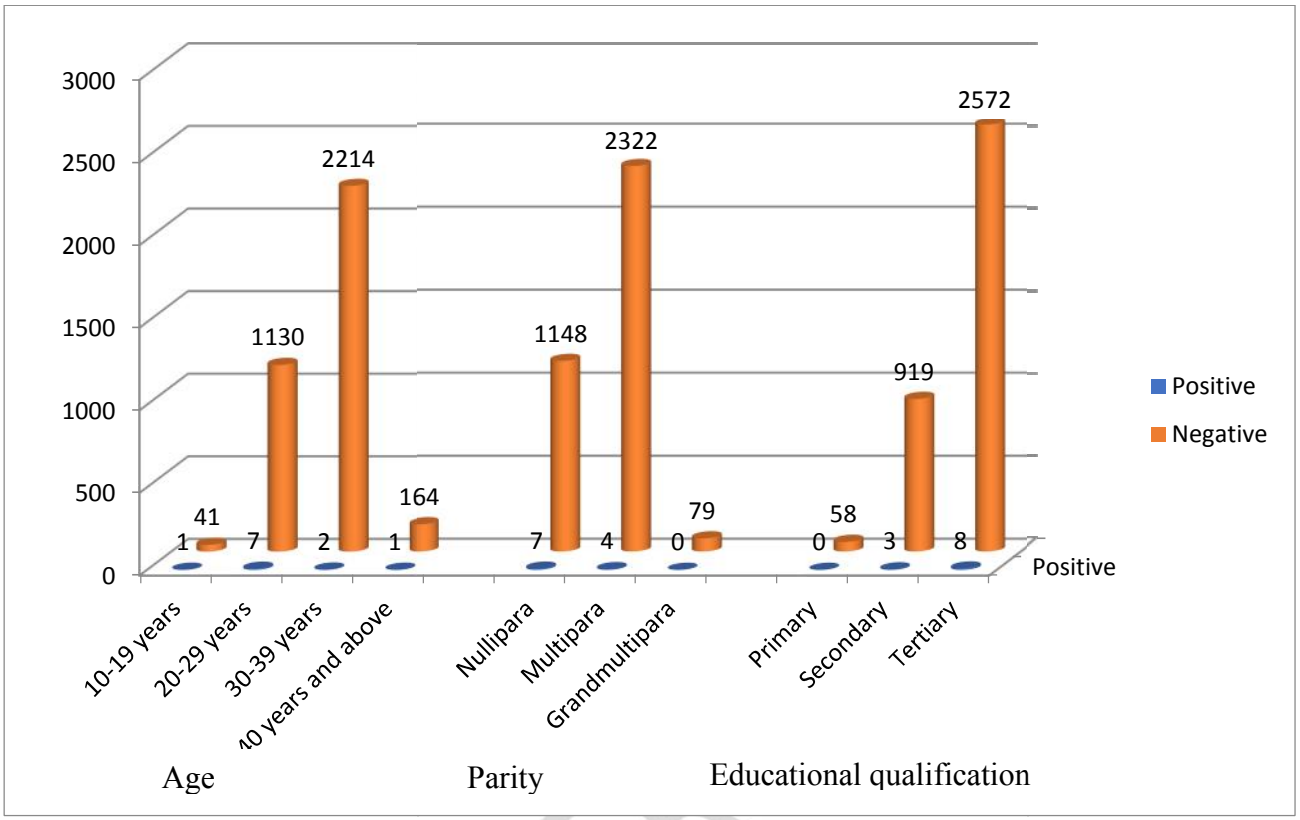

Fig. 2: Prevalence of VDRL by Age, Parity and Education among clinic Attendees.

Table 3: Prevalence and Determinants of Positive VDRL cases among Clinic Attendees:

Characteristics	VDRL			Chi-square	df	p-value
	Positive (n/%)	Negative (n/%)	Total			
Age group				**13.240**	3	0.004*
10-19 years[R]	1 (2.4)	41 (97.6)	42			
20-29 years	7 (0.6)	1130 (99.4)	1137			
30-39 years	2 (0.1)	2214 (99.9)	2216			
40 years and above	1 (0.6)	164 (99.4)	165			
Parity				4.972	2	0.083
Nullipara	7 (0.6)	1148 (99.4)	1155			
Multipara	4 (0.2)	2322 (99.8)	2326			
Grand-multipara	0 (0.0)	79 (100.0)	79			
Educational qualification				0.188	2	0.910
Primary	0 (0.0)	58 (100.0)	58			
Secondary	3 (0.3)	919 (99.7)	922			
Tertiary	8 (0.3)	2572 (99.7)	2580			

***p-value is significant**

Discussion:

The seroprevalence of Syphilis screening with VDRL of 0.3% found in this study is quite low. This figure is lower than the range of 0.6% - 2.3% reported over the last five decades in Nigeria [5][6][8] and in other African Countries [9][10][11]. This is however, higher than the prevalence of 0.05% reported in Maiduguri, Norther Nigeria [7], but significantly less than 7.28% earlier reported in our center [14] and 10% prevalence reported in Oshogbo, Western Nigeria [19]. This implies that the prevalence of syphilis in Nigeria has been on a decline, and it is buttressed by the year on year decrease in the prevalence in this study of 0.5% in 2017 and 0.2% in 2018. Similarly, the results of previous study in Enugu, Nigeria on VDRL screening in pregnancy by Ikeme and Okeke [20] strongly showed a continuing very low prevalence rates of syphilis (3.06%, 1.3%, 0.125%).

The low prevalence found in this study, and indeed the declining prevalence rates across the country, may be attributable to less risky sexual behavior, interventions to control HIV/AIDS, widespread availability of antibiotics and introduction of syndromic management of STIs.

The value of the VDRL test lies in its low cost and ease of titration, however, there is a very high false-positive result rate associated with its use. More specific test like TPHA are needed to exclude false positive cases. Biological false positivity of 0.02 to 0.7% were reported by various studies in Nigeria [7][21]. In our study population, confirmatory tests were not done due to non-availability of test kits, and we could no ascertain the number of false positive cases.

The highest proportion of positive results (8/11) was recorded in the ≤29 years, giving a prevalence of positive cases of 72.7% in this group. This agrees with the findings of Bukar M et at [7] in Maiduguri, Northern Nigeria. This could be due to the higher sexual activity in this group which therefore make them more vulnerable to risk of acquiring infections. The difference in the relationship of age groups and seropositivity in this study was statistically significant at $p<0.05$. The younger the age of the patient below 29 years, the more likely the patient would have a positive VDRL test.

The Mean gestational age at booking in our center was 22.1 weeks. This suggest that most women book at a time when the effect of syphilis on the fetus would have occurred and late detection of syphilis would have little effect on the overall outcome of the pregnancy. Early booking and screening are essential in preventing congenital syphilis. There was no documentation of treatment offered in all 11 cases and there were no reports of congenital syphilis in the babies of the mothers.

The estimated cost of VDRL, at N1000 in RSUTH, is $3; meaning that about N3, 560, 000 ($10, 680) was spent to detect the 11 VDRL positive cases. In our society, more than a third of the population live in extreme poverty, and diseases such as anaemia, malaria and malnutrition are still highly prevalent. These are certainly more important reproductive health issues than syphilis.

This study may be limited by the fact that it is a retrospective study and there might be inaccuracies in the documented data such as the treatment of positive cases and the effects of congenital syphilis on the babies, especially as they were not followed up through childhood. The study is also hospital based and may not reflect what happens in the general population in the state, as some pregnant women do not access the tertiary institution.

Conclusion:

The seroprevalence rate of syphilis in this study was low, and due to the overall low sensitivity of the VDRL test, initial screening in our center using VDRL alone is neither justified nor cost effective. Selective screening based on risk factors, like younger age, and specific test with TPHA is recommended.

Source of Support: Nil

Conflict of Interest: None

References:

1. US Preventive Service Task Force. Screening Syphilis Infection: Recommendation Statement. Ann Fam Med 2004; 2: 362-365.
2. Lewis DA, Young H. Syphilis. Sex Transm Inf. 2006; 82: iv13-iv15.
3. Watson-Jones D, Oliff M, Terris-Prestholt F, et al. Antenatal syphilis screening in sub-Saharan Africa: lessons learned from Tanzania. Trop Med Int Health 2005; 10: 934-943.
4. World Health Organization. Guidelines for the management of Sexually Transmitted Infections. 2001. World Health Organization, Geneva.
5. Osoba AO. Serological test for syphilis among hospital patients in Ibadan, 1968-1970. Proceedings of the first medical research seminar, Fifty years of medical research in Nigeria, 1-4 February 1972. Yaba, Lagos: Academic Press; 1972: 49-52.
6. Ekele BA, Bello CSS. Sero-reactivity amongst pregnant women screened for syphilis at Jos University Teaching Hospital. Niger J Med 1997; 6: 11-13.
7. Bukar M, Audu BM, Takai UI, Ajayi BB, Kullima AA. Is routine antenatal screening for syphilis in Nigeria still justified clinically and economically? Saudi Med J. 2009; 30: 1311-15.
8. Nwosu BO, Eleje GU, Obi-Nwosu AL, Ahiarakwem IF, Akujobi CN, Egwuatu CC et al. Is routine veneral disease research laboratory test still justified? International Journal of Women's Health 2015; 7: 41-46. Available at https://doi.org/10.2147/IJWH.S70442.
9. Hira S, Ratnam A, Bhat G, et al. Congenital syphilis in Lusaka-11. Incidence at birth and potential risks among hospital delivered infants. East Afr Med J. 1982; 59: 306-308.
10. Azeze B, Fantahun M, Kidan KG, Haile T. Seroprevalence of syphilis among pregnant women attending antenatal clinics in a rural hospital in north west Ethiopia. Genitourin Med. 1995; 71: 347-350.
11. Hira SK, Bhat GJ, Chikamata DM. Syphilis intervention in pregnancy: Zambian demonstration project. Genitourin Med. 1990; 66: 159-164.
12. Skarpass T, Loe K. The occurrence of positive serological syphilis reactions in pregnant women in Norway 1964-1978. *Tidsskr Nor Laegeforen*. 1980; 100: 1840-43.
13. Klass P, Brown E, Pelton S. The incidence of prenatal syphilis at the Boston City Hospital: a comparison across four decades. Paediatrics. 1994; 94: 24-28.
14. Iyalla C, Omunakwe H, Okoh DA. A retrospective study of the seroprevalence of antibodies to HbsAg, HIV-1/2 and Syphilis amongst pregnant women at booking in a tertiary hospital in Port Harcourt, Southern Nigeria. IOSR Journal of Dental and Medical Sciences. 2016; 15(6): 86-92. Available at https://doi.org/10.9790/0853-1506028692.
15. World Health Organization. The Global Elimination of Congenital Syphilis: Rational and Strategy for Action. 2007; WHO, Geneva. Available at http://whqlibdoc.who.int/publications/2007/9789241595858_eng.pdf. Accessed October 2019.
16. WHO/TDR. Sexually Transmitted Diseases Diagnostic Initiative, Evaluation of rapid diagnostic tests: syphilis. Nat Rev Microbiol. 2006; 4(Suppl 12): S33-S40.
17. Olubukola A. Adesina O. Routine Antenatal Syphilis Screening in South-West Nigeria – A questionable practice. Annals of Ibadan Postgraduate Medicine 2010; 8: 1. Available at http://dx.doi.org/10.4314/aipm.v8i1.63952.
18. Obisesan KA, Ahmed Y. Routine antenatal syphilis screening – A case against. Afr J. Med. Med. Sci. 1999; 28: 185-187.

19. Ojo DA, Oyetunji IOA. Seroprevalence of syphilis among pregnant women in Oshogbo in southwestern Nigeria. ASSET Series B. 2007; 6(1): 61-65.
20. Ikeme AC, Okeke TC. The prevalence of VDRL as routine test for pregnant women: a critical study. Niger J Clin Pract 2006; 9: 65-7.
21. Taiwo SS, Adesiyi YO, Adekanle DA. Screening for syphilis during pregnancy in Nigeria: a practice that must continue. Sex Transm Infect 2007; 83: 357-9.