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

6
7 **Abstract:**

8 **Background:** Untreated maternal syphilis is strongly associated with adverse birth outcomes. The WHO
9 recommends routine serological screening in pregnancy. Some workers have advised a reappraisal of this
10 practice, having demonstrated low seroprevalence in their antenatal population.

11 **Objective:** To determine the prevalence of seropositive VDRL cases amongst pregnant women at the
12 Rivers State University Teaching Hospital (RSUTH) in order to justify the need and cost-effectiveness for
13 continued routine syphilis screening using VDRL alone.

14 **Methodology:** A retrospective review of hospital and laboratory records of all pregnant women booked
15 for antenatal care (ANC) at RSUTH in a two-year period, from 1st-May 2017 to 30th April 2019, was
16 carried out. Data on patients' age, parity and educational level, and reactivity of VDRL test at booking
17 were retrieved using structured pro-forma and analyzed using Epi Info Version 7. Test for significance
18 using Chi-square was set at significant level of $P < 0.05$.

19 **Results:** 3560 clinic patients had VDRL screening out of which 11 were positive. The overall prevalence
20 rate in this study was 0.3%. The mean age was 31.5 ± 4.7 years and the mean gestational age at booking
21 was 22.1 ± 6.8 weeks. There was no significant relationship between their Party ($\chi^2 = 4.972$, **p-**
22 **value=0.083**) and Education ($\chi^2 = 0.188$, **p-value=0.910**) and seropositivity. However, age distribution
23 and seropositivity was significant ($\chi^2 = 13.240$, **p-value=0.004**). **The younger the patient below 29 years,**
24 **the more likely a positive VDRL test.** The cost of VDRL test per patient in RSUTH is \$3, to detect the 11
25 cases the sum of \$10,680 was spent.

26 **Conclusion:** The seroprevalence rate of syphilis in this study was low. Initial screening using VDRL
27 alone is neither justified nor cost effective. Selective screening based on risk factors, like younger age,
28 and specific test with TPHA is recommended.

29
30 **Key Words:** VDRL, Syphilis Screening, Prevalence, Determinants, Pregnancy, Rivers State,

31 **Introduction:**

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

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

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

45 The seropositive rate among pregnant women reported in Nigeria in the last five decades has been put at
46 <3% [5] [6] [7] [8], while generally in Africa, the figure is in the range of 3%-18% [9] [10] [11]. While
47 syphilis during pregnancy in the western world today is rare [12][13] largely due to effective antenatal
48 screening, maternal syphilis remains a problem in many countries of sub-Saharan Africa [9][11]. In a
49 previous retrospective study at our center over a ten-year period, 2004-2013, involving 12,971 patients,
50 the prevalence was put at 7.28% [14]. No confirmatory test was done then, as it is not done now. That was
51 quite some time ago and needs to be revalidated.

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

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

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

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

70 **Methodology:**

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

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

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

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

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

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

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

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

108 **Results:**

109 During the study period, 3560 antenatal clinic patients had VDRL screening out of which 11 were
110 positive. The overall prevalence rate in this study was 0.3%, declining from 0.5% in 2017 to 0.2% in 2018
111 (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
112 mean gestational age at booking of 22.1 ± 6.8 weeks and the modal parity was 3. Table 2 and Figure 1
113 shows the distribution of sociodemographic characteristic of the clinic attendees.

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

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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

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

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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

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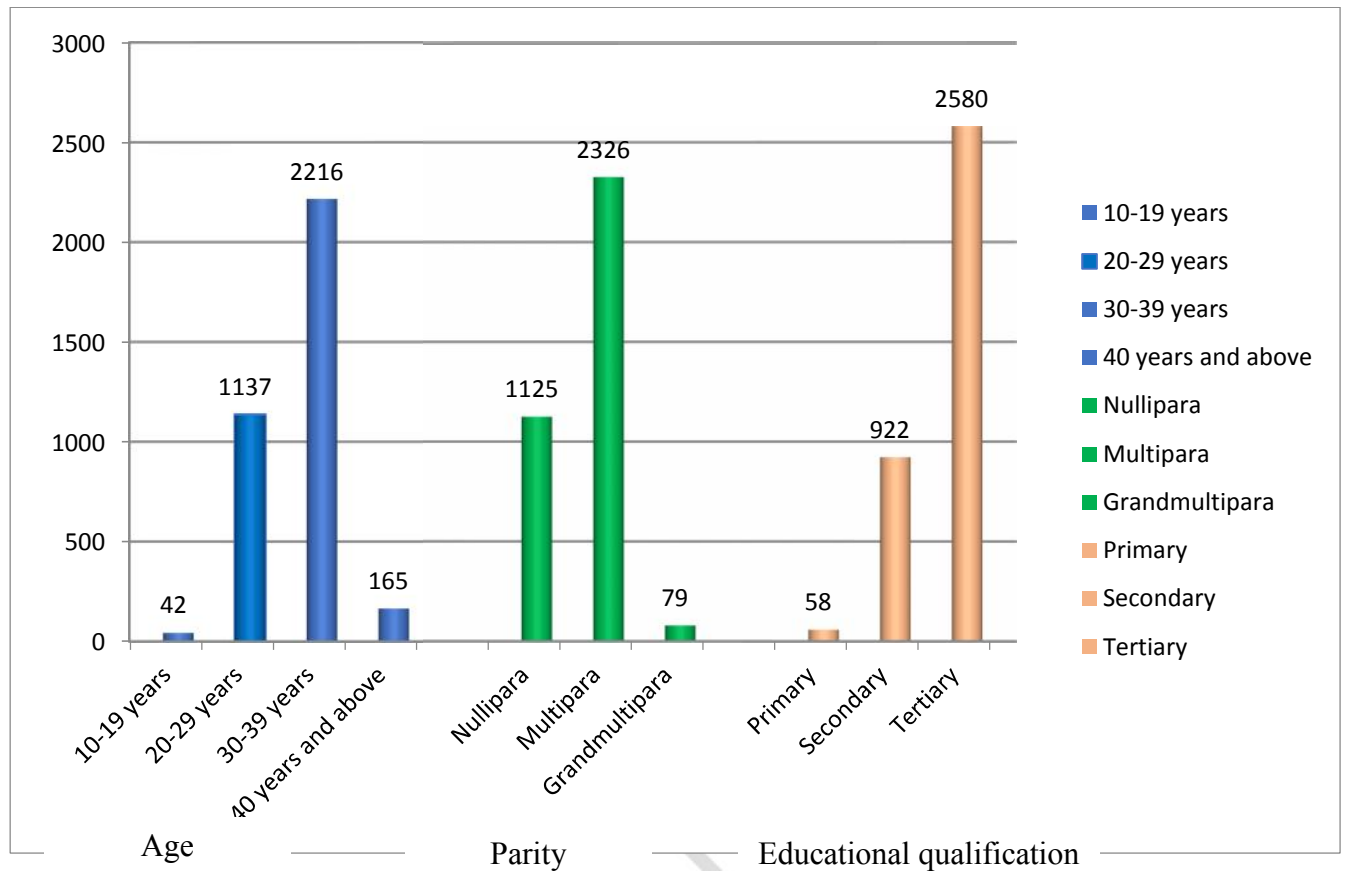


Figure 1: Distribution of Socio-Demographic characteristics of the attendees

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 Parity ($\chi^2 = 4.972$, $p\text{-value}=0.083$) and Educational Status ($\chi^2 = 0.188$, $p\text{-value}=0.910$) and seropositivity at booking. However, age distribution and seropositivity was statistically significant ($\chi^2 = 13.240$, $p\text{-value}=0.004$). The younger the age of the patient below 29 years, the more likely the patient would have a positive VDRL test.

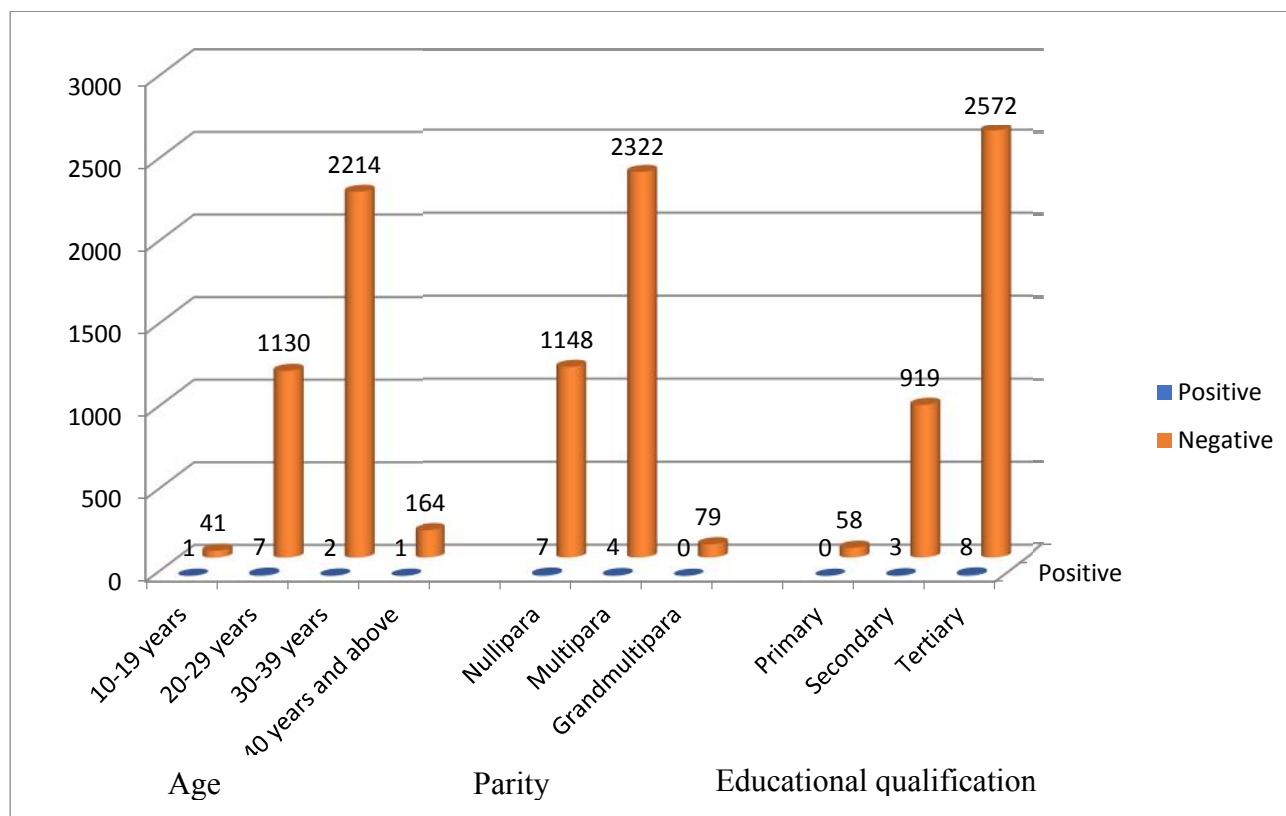


Fig. 2: Prevalence of VDRL by Age, Parity and Education among clinic Attendees.

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

Characteristics	VDRL		Total	Chi-square	df	p-value
	Positive (n/%)	Negative (n/%)				
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

148 **Discussion:**

149 The seroprevalence of Syphilis screening with VDRL of 0.3% found in this study is quite low. This figure
150 is lower than the range of 0.6% - 2.3% reported over the last five decades in Nigeria [5][6][8] and in other
151 African Countries [9][10][11]. This is however, higher than the prevalence of 0.05% reported in
152 Maiduguri, Norther Nigeria [7], but significantly less than 7.28% earlier reported in our center [14] and
153 10% prevalence reported in Oshogbo, Western Nigeria [19]. This implies that the prevalence of syphilis
154 in Nigeria has been on a decline, and it is buttressed by the year on year decrease in the prevalence in this
155 study of 0.5% in 2017 and 0.2% in 2018. Similarly, the results of previous study in Enugu, Nigeria on
156 VDRL screening in pregnancy by Ikeme and Okeke [20] strongly showed a continuing very low
157 prevalence rates of syphilis (3.06%, 1.3%, 0.125%).

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

161 The value of the VDRL test lies in its low cost and ease of titration, however, there is a very high false-
162 positive result rate associated with its use. More specific test like TPHA are needed to exclude false
163 positive cases. Biological false positivity of 0.02 to 0.7% were reported by various studies in Nigeria
164 [7][21]. In our study population, confirmatory tests were not done due to non-availability of test kits, and
165 we could no ascertain the number of false positive cases.

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

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

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

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

186 **Conclusion:**

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

190 **Source of Support:** Nil

191 **Conflict of Interest:** None

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UNDER PEER REVIEW