Outcomes of Antenatal Booking Laboratory Investigations: A Report from Ilorin, Nigeria.

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Abstract

Background: *Antenatal booking laboratory investigations provide information on the health status of antenatal women and at a glance highlight to the health provider areas to focus attention. The study aimed to describe the results of these investigations and emphasize their benefits.*

Methods: *A cross-sectionalstudy conducted at the University of Ilorin Teaching Hospital, Ilorin between January 2017 and December2018. Participants were antenatal women who had their booking laboratory investigations results reviewed at the antenatal clinic. The investigations included Packed Cell Volume, urinalysis, Veneral Disease Research Laboratory, blood group, Rhesus typing, genotype, hepatitisB surface antigen, anti-hepatitis C antibody test and HIV screening. Data analysis was performed using SPSS version 21.0 and p<0.05 was significant.*

Results: *Among the 1,000antenatal women, the mean age was30.0±5 years while 420(42.0%) booked in the second trimester. The mean Packed Cell Volume at booking was 30±3%, 454(45.4%) had aneamia,260(26.0%) were diagnosed with HIV, 117(11.7%) had abnormal urinalysis results, Veneral Disease Research Laboratory test was reactive in 45(4.5%), 232(23.2%) were HBSAg reactive, 74(7.4%) were reactive to anti-HCV, 39 (3.9%) had genotype SS while 33(3.3%) were Rhesus D negative. There were associations between level of education (P=0.001), parity (P=0.001), or being married (P=0.003) and positive HIV result; being married (P=0.008) and reactive hepatitis B surface antigen test or level of education (P=0.002) and reactive Anti-HCV result.*

Conclusion: *Uptake of antenatal laboratory booking investigations should be encouraged to enhance detection and management of abnormalities thereby improving pregnancy outcome.*

KEYWORDS: Antenatal tests, care, routine investigations, booking, laboratory.

Introduction

Antenatal care (ANC) is aimed at reducing maternal, foetal and neonatal morbidity and mortality through disease prevention, health promotion and treatment in order to enable pregnant women attain and maintain a healthy status throughout pregnancy, delivery and puerperium[1,2]. The entry point to ANC is the booking visit; this includes a comprehensive clinical evaluation, request for routine laboratory investigations and a discussion on the results of the investigations by a healthcare provider. These investigations include Packed Cell Volume (PCV), urinalysis, haemoglobin genotype, blood group and Rhesus typing, HIV screening, veneral disease research laboratory (VDRL), hepatitis B surface antigen and anti hepatitisC antibody test. These investigations are important in establishing the baseline health status of the antenatal women, detect as well as treat any abnormality that is detected[1,2].

The PCV is employed to diagnose anaemia and grade its severity; anaemia affects an estimated 38% of antenatal women worldwide and it is associated with maternal, foetal and neonatal morbidities including maternal exhaustion and fatigue, intrauterine growth restriction (IUGR), intrauterine foetal death (IUFD) and low birth weigh[3]. The ABO blood grouping and Rhesus typing remains a globally acceptable categorization of humans blood systems; unlike the ABO blood group system there is no preformed Rh antibody but it is produced following sensitization due to exposure to Rh positive blood[4,5].Urinalysis is a biochemical analysis of urine using a test strip to check the pH, presence of protein, glucose, leucocyte and ketone as well as the specific gravity among others[6,7]. The viral infections screened for during pregnancy include hepatitis B, hepatitis C and HIV infections; maternal hepatitis B virus (HBV) infection is associated with vertical transmission necessitating antenatal screening[8]. Most early stage HIV-infected antenatal women are asymptomatic and unaware of their status despite the possibility of vertical transmission[9]while an estimated half of the perinatal HIV transmission occurs mainly during labour and delivery[10]. Syphilis is a systemic disease of public health importance because of its adverse effect on pregnancy outcome[11-13].

However, despite the routine status and central role of routine antenatal laboratory investigations, many antenatal women seem to be unaware of these benefits while a number do not participate in the test such that further evaluation and necessary interventions are impeded. This study is aimed at evaluating the results of these antenatal laboratory tests among antenatal clinic attendees at a tertiary facility.

Materials and Methods

The study was a retrospective, cross-sectional study conducted at the antenatal clinic of the University of Ilorin Teaching Hospital which is a tertiary health facility in Ilorin, North Central Nigeria. Study participants were antenatal women, who received care at the study site between 1st January 2017 and 31st December, 2018.

Antenatal women who booked index pregnancy at the study site, conducted the routine antenatal investigations and the investigation results were available in the case file were included in the study. However, those who did not perform the requested investigations or those whose results were not available in the case files were excluded from the study.

The sample size was calculated using the formula[14]

$$n = 2\,\frac{z^2pq}{d^2}$$

n= desired sample size
z= standard normal deviate set as 1.96 which corresponds to 95% confidence interval
p = proportion in the target population who completed routine antenatal laboratory investigations i.e. 0.32 (i.e. 32.0%)[15].

q = 1.0 – 0.32 = 0.68
d= degree of accuracy desired set at 0.05

$$n = 2 \times \frac{1.96 \times 1.96 \times 0.32 \times 0.68}{(0.05)^2} = 668.8 = 669$$

With 20% attrition rate i.e. 134, the minimum sample size for the study was 669+134= 803.

The antenatal women were recruited using purposive sampling. The study procedure included compilation of the list of women who booked during the study period using the antenatal clinic records. Thereafter, the case files of the women were retrieved from the medical records department and screened for eligibility using the study inclusion and exclusion criteria. Eligible case files were selected consecutively into the study until the sample size was completed. Then relevant information was extracted using a data collection sheet or proforma designed for the study. The information included maternal biosocial parameters as well as the laboratory results including PCV, Urinalysis, HBsAg, anti-HCV antibody, blood group and Rhesus typing, genotype, VDRL and HIV screening tests.

The results were entered into SPSS version 21.0 software for analysis and the results were presented in tables; test for significance was done using Chi-square while p value <0.05 was significant. Institutional approval was obtained before the commencement of the study.

Results

Table 1: Biosocial characteristics and time of booking among study participants

Parameter	Frequency	%
Age groups		
<=19	17	1.7
20-35	885	88.5
>35	98	9.8
Mean age	30.0±5	
Level of formal education	76	7.6
None	129	12.9
Primary	375	37.5
Secondary	420	42.0
Tertiary		
Parity		
0	172	17.2
1	733	73.3
2-4	61	6.1
>=35	34	3.4
Marital status		
Single	213	21.3
Married	787	78.8

Parameter	Frequency	%
-Monogamous	680	68.0
-Polygamous	107	10.7
Number of children alive	199	19.9
0	455	45.5
1	320	32.0
2-4	26	2.6
=5		
Time of booking		
First trimester	186	18.6
Second trimester	722	72.2
Third trimester	92	9.2

During the study period, a total of 2,105 antenatal women booked at the antenatal clinic out of which 1,000 were included in the study. From table 1, the mean age of participants was 30±5 years (range 18 to 42 years), 420 (42.0%) had tertiary education while 76 (7.6%) had no formal education. Also, 733 (73.3%) were Primipara, 787 (78.7%) were married, 680 (68.0%) were in monogamous marriage. Also, 186(18.6%) participants booked in the first trimester, 722 (72.2%) in the second trimester and 92 (9.2%) in the third trimester.

Table 2: Results of antenatal laboratory screening tests among participants

Parameter	Frequency	%
Packed CellVolume (%)		
<33	454	45.4
>=33	546	54.6
Mean value	30±3	
Urinalysis result		
Normal	883	88.3
Abnormal	117	11.7
VDRL		
Non-reactive	955	95.5
Reactive	45	4.5
HIV screening		
Positive	260	26.0
Negative	740	74.0
Hepatitis B screening		
Reactive	232	23.3
Non-reactive	768	76.8
Anti-Hepatitis C virus screening		
Reactive	74	7.4
Non-reactive	926	92.6
Blood group		
O Rhesus positive	652	65.2
A Rhesus positive	216	21.6

Parameter	Frequency	%
B Rhesus positive	66	6.6
AB Rhesus positive	33	3.3
O Rhesus negative	8	0.8
A Rhesus negative	10	1.0
B Rhesus negative	13	1.3
AB Rhesus negative	2	0.2
Genotype		
AA	670	67.0
AS	202	20.2
AC	31	3.1
SC	58	5.8
SS	39	3.9

From table 2, the mean PCV was 30%±3, 454(45.4%) women had anaemia at booking, 117(11.7%)had abnormal urinalysis result, 45(4.5%) had reactive VDRL test result, 260(26.0%) were HIV positive, 232(23.2%) were reactive to hepatitis B surface antigen test while 74(7.4%) had reactive anti-HCV screening result. In addition, 33(3.3%)were Rhesus negative, 652(65.2%) were O Rhesus positive while 8(0.8%) were O Rhesus negative; genotype AA was reported for 670(67.0%), 202(20.2%) for AS, 31(3.1%) for AC, 58(5.8%) for SC and 39(3.9%) for SS genotype respectively

Table 3: Relationship between biosocial characteristics and viral screening test results

Parameter	HIV screening		X^2	P	Hepatitis B screening		X^2	P	Anti-HCV result		X^2	P
	Positive	Negative			Positive	Negative			Reactive	Non-reactive		
	n=260	n=740			n=232	n=768			n=74	n=926		
Level of education												
None	24(9.2)	52(7.0)	72.523	0.000	18(7.8)	58(7.6)	6.7224	0.081	1(1.4)	75(8.1)	14.483	0.002
Primary	15(5.8)	114(15.4)			36(15.5)	93(12.2)			7(9.5)	122(13.2)		
Secondary	58(22.3)	317(42.9)			97(41.8)	278(36.2)			42(56.8)	333(36.0)		
Tertiary	163(62.7)	257(34.7)			81(34.9)	339(44.1)			24(32.4)	396(42.8)		
Parity												
0	53(20.4)	119(16.1)	50.199	0.000	34(15.3)	138(18.3)	1.0859	0.780	12(16.4)	160(17.7)	3.188	0.374
1	185(71.1)	548(74.1)			172(77.4)	561(74.5)			52(71.2)	681(75.5)		
2-4	0(0.0)	61(8.2)			24(10.3)	47(6.2)			8(11.0)	53(5.9)		
=5	22(8.5)	12(1.6)			2(0.9)	7(0.9)			2(2.7)	8(0.9)		
Marital status												
Married	188(72.3)	599(80.9)	8.565	0.003	197(84.9)	590(76.8)	6.9580	0.008	63(85.1)	724(78.2)	1.974	0.160
Single	72(227.7)	141(19.1)			35(15.1)	178(23.2)			11(14.9)	202(21.8)		

Table 3 shows that positive HIV screening result was significantly associated with the level of education (P=0.001), parity (P=0.001), being married (P=0.003) and belonging to amonogamous marriage (P=0.001). Reactive hepatitisB surface antigen screening test was significantly associated with being married (P=0.008) but not significant relative to level of education (P=0.081), parity (P=0.780) or type of marriage (P=0.964). Also, a reactive anti-HCV result was significantly associated with the level of education (P=0.002) while parity (P=0.374), marital status (0.160) and type of marriage (P=0.204) were not significant. Among women with positive HIV screening test result, 62.7% had tertary level of education, 71.2% were primipara, 72.3% were married while 63.1% were in monogamous marriage. For women with positive hepatitisB surface antigen screening result, 41.8% had secondary education, 77.4% were primipara, 84.9% were married while 76.7% were in monogamous marriages. For women with reactive anti-HCV result, 56.8% had secondary level of education, 71.2% were primipara, 85.1% were married while 78.4% were in monogamous marriage.

Discussion

Some of the laboratory investigations at booking showed abnormal results and were useful in identifying some clinical conditions which required intervention. Anaemia at booking was recorded in 45.4% of the antenatal women; this compares to 47.3% from Ondo[16]and 54.5% from Uyo[17]but lower than the 60.4% reported by Babatunde et al from Ilorin[18]allin Nigeria. In a previous study, the authors reported that antenatal supplementation with haematinics reduced anaemia from 43.8% at booking to 18.8% in labour among grandmultipara and a reduction from 20.3% to 4.7% among multiparas[19]; this would not have been possible without the booking PCV which enahanced the diagnosis thereby emphasizing its benefit.

The 26.0% prevalence of HIV in pregnancy reported in this study compares with 26.4% from Ibadan, Nigeria by Okonko et al[20]. Although the prevalence is high, it is connected to the referral status of the study centre as a regional Prevention of Mother-to-Child Transmission (PMTCT) centre. However, the diagnosis provided opportunity for partner counselling, notification and screening as well as treatment of infected women with the potential to reduce vertical transmission and reduce cases of infant HIV infection. The reported 3.3% prevalence of Rh negative status was lower compared to 4.4% from Port Harcourt[21] and 9.11% from Enugu[22] in Nigeria. While this shows the variation in Rhesus status, it provides the opportunity for further evaluation, screening for sensitization, maternal prophylaxis and eventual prevention of foetal and neonatal complications especially severe haemolytic disease of the newborn[21,22]. Rhesus incompatibility poses a challenge to the Rhesus positive foetus of a Rhesus negative woman when the Rh antibody crosses the placenta causing haemolysis of the foetal red blood cells leading to haemolytic disease of the newborn or erythroblastosis foetalis[5]. Maternal antenatal and postnatal Rh D immune globulin prophylaxis has led to a significant reduction in maternal Rh D alloimmunization and its associated foetal and neonatal complications in high income counntries[5]. However, in low resource countries, maternal Rh D alloimmunization still occurs with significant perinatal morbidity and mortality[4]. The record of 67% for genotype AA compares to previous reportts of 70%[21], 76.8%[22] and 80.1%[23];

however, genotype SS was 3.9% which is far greater than 0.56%[21],0.15%[22]and 0.14% [23]in other parts of Nigeria. This brings to the fore the variation in the sicle cell anaemia in a country and the need for diagnosis so that adequate interventions can be instituted. In addition, a previous report showed that haemoglobinopathy especially Hb SS was associated with poor pregnancy outcome including higher maternal mortality[28].

The VDRL is the widest used nontreponemal test for Syphilis; it becomes positive 3 to 6 weeks after infection or 2 to 3 weeks after the appearance of the primary lesion[12] while false positive serology results occur with concurrent malaria, leprosy and pregnancy[13]. This study reported 4.5%prevalence on reactive results to Syphilis screening with VDRL which is higher than0.7%[25] and 1.8%[26]from previous reports in Nigeria. The wide variation may be attributed to the laboratory methods used for the diagnosis. Most people with Syphilis are asymptomatic or show transient lesions, thus serological tests are often the preferred method of testing;simple and cheap rapid plasma reagin (RPR) or VDRL that detect cardiolipin antibodies which are found in acute or recent syphilis are often used for diagnosis as seen in this study. However, these tests are non-specific treponemal tests with high false-positive result rate. The *Treponemapallidum* haemaglutination assay (TPHA) is a more specific test that can exclude false-positive cases, but the capacity for this test is not readily available. Ede et al in Jos, Nigeria reported 1.8% prevalence for Syphilis with VDRL and 1.2% with TPHA in the same set of patients due to false posistive cases[12]. Similarly, Nwosu et al reported a false-positive rate of 73.3% with VDRL compared to TPHA[25]. Therefore, it was suggested that a second step where VDRL results are confirmed with Treponemal-specific antigens such as TPHA or *T pallidum* particle-agglutination assay should be considered following reactive VDRL tests. However, the capacity for TPHA is limited in low-income countries because it requires trained personnel, refrigeration to store the reagents and electricity to run equipments, resultsare available days or weeks later, loss of specimen during transport may occur while patients may not return for either the result nor treatment.

The reported seroprevalence of 23.2% for HBV and 7.4% for HCV is higher than 14.6% and 2.0% respectively reported from Bauchi, Nigeria by Jibrin et al[27]. Maternal HBV infection is important especially in view of the possible vertical transmission and its attendant risk of higher probability for liver cirrhosis and hepatocellular carcinoma in earlylife[27]. Therefore, the screening and diagnosis provides the opportunity for interventions in infected antenatal women to maintain a maternal healthy state as well as prevent vertical transmission. Inaddition, the significant association of positive hepatitis B surface antigen test to being married can be explained by the virus being sexually transmitted. The transmission of HBV has been reported to be related to the sexual behaviours such as non-adherence to safe sex practice, multiple sexual partners and contact with sex workers among infected individuals and their spouses[28,29]. The observed increase in positive HCV infection with increasing level of education in this study contrasts to an earlier report from Egypt which reported a higher prevalence among illiterates[30]. A possible explanation for the difference may be that while this study was conducted in an urban area, the reference was from a rural community.

Conclusion

The study concludes that antenatal laboratory booking screening test results provide an opportunity to define baseline maternal health status, diagnose abnormalities as well as initiate interventions to safeguard maternal, foetal and neonatal health. Therefore, universal antenatal care services should be promoted while antenatal women should be encouraged to participate in these screening tests for optimal pregnancy outcomes.

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