

---

# ASSESSMENT OF COMPLIANCE OF MOTHERS OF HIV EXPOSED INFANTS TO EARLY INFANT DIAGNOSIS SERVICES IN SELECTED HEALTH FACILITIES IN ANAMBRA STATE

Okwukweka Godslove Igweze, Christian Chibuzo Ibeh & Chijioke Amara Ezenyeaku.

Department of Community Medicine, Faculty of Medicine, Nnamdi Azikiwe University, Awka.

## Abstract

**Background:** *Mother-to-child transmission remains the leading cause of new HIV infections in children. Despite progress, gaps in testing and implementation of Prevention of Mother-to-Child Transmission (PMTCT)/Early Infant Diagnosis (EID) programs leave many children undiagnosed, emphasizing the need for further studies and improved strategies. This study was aimed at assessing the compliance of mothers of HIV-exposed infants to early infant diagnosis in selected health facilities in Anambra State.*

**Subject and Methods:** *Across-sectional descriptive study was carried out among mothers of HIV-exposed infants accessing care in selected health facilities in Anambra State using interviewer-administered questionnaire. The data were analyzed using SPSS version 27.*

**Results:** *The mean age of the mothers was  $31.2 \pm 5.3$  years. Majority of the mothers were aged between 31 and 40 years (46.2%). Out of the 264 mother/infant pairs, compliance to testing appointments varied at different stages, with the highest compliance being at 6 months/6 weeks after breastfeeding. Most infants received Nevirapine at birth (97.7%) whereas 87% received Cotrimoxazole. Most mothers (88%) complied with requisite feeding pattern. Results from DNAPCR testing were mostly received over a month after sample collection. Travelling from base to another location by the mothers and forgetfulness were significant contributors to delayed utilization of EID services. The mentor mother support system promotes compliance.*

**Conclusion:** *The compliance of mothers of HIV-exposed infants to early infant diagnosis in selected health facilities in Anambra State is high. However, delays in notifying mother/infant pairs of their test results could lead to mothers missing follow-up appointments and not receiving timely treatment if their infants are HIV-positive. There is therefore a need for a comprehensive strategy to adequately address all these factors in order to improve the outcomes for HIV-exposed infants.*

**Keywords:** Compliance, Mothers, Human Immunodeficiency Virus, Mother-To-Child Transmission, Early Infant Diagnosis, Health facilities, Anambra

## Introduction

The Human immunodeficiency virus (HIV) is a virus that targets cells responsible for the body's immune response thereby increasing susceptibility to various infections and illnesses. It spreads through contact with specific body fluids of an infected person, primarily through unprotected sex or sharing injection drug equipment. Without treatment, HIV can progress to AIDS (acquired immunodeficiency syndrome) (HIV.gov, 2023).

HIV/AIDS has been a source of public health concern globally. The Joint United Nations Programme on AIDS (UNAIDS) in 2022 reported that there were about 39 million people living with HIV, comprising of about 37.5 million adults (15 years or older) and 1.5 million children (0–14 years) globally. Of the 39 million people, 53% were women and girls. Globally, over 1 million new infections were recorded in the same year with over 130,000 being under 14 years (UNAIDS, 2023). In West and Central Africa, there were about 51,000 new infections in children under 14 years (UNAIDS, 2023). According to the National Agency for the Control of AIDS (NACA), there were over 3 million Nigerians living with HIV in 2023 (NACA, 2023). The Anambra State AIDS Control Agency revealed that the state had 98,960 residents living with HIV and was the fifth highest in Nigeria in terms of HIV transmission among people between 15 to 49 years (The Cable, 2023).

More than 90% of HIV infections in children were due to mother to child transmission (UNAIDS, 2014). Infants can get infected through their HIV positive mothers during pregnancy, child-birth and during breastfeeding (Bwana et al, 2016; UNAIDS, 2014). Since the majority of HIV infections in children are due to mother to child transmission, the world health organization (WHO) in 2010 recommended the prolonged use of antiretroviral drugs (ARVs) during pregnancy and that mothers living with HIV, or their infants, take ARVs while breast-feeding up to 12 months to prevent HIV transmission. When implemented, these recommendations were expected to reduce the risk of transmission from 35 per cent to less than 5 per cent in breast-feeding populations, and from 25 per cent to less than 2 per cent in non-breast-feeding populations (WHO, 2010).

The PMTCT programme as endorsed by the WHO and UNICEF targets primary prevention of HIV among women of childbearing age, prevention of unintended pregnancies among women living with HIV, prevention of HIV transmission from a woman living with HIV to her infant and provision of appropriate treatment, care and support to women living with HIV and their children and families (Oleribe et al, 2018). It also supports safe childbirth practices and appropriate infant feeding, as well as providing infants exposed to HIV with virological testing after birth and during the breastfeeding period, ART for prevention and effective treatment (Nkwo, 2012; Avert, 2019).

It has been reported that most HIV infected infants and children die without knowing their HIV status (UNAIDS, 2014) and that an estimated half of all HIV- exposed infants receive an EID test within the first 2 months of life (WHO, 2010). These children are among the most vulnerable of those living with HIV, and without access to treatment, are at a very high risk of mortality (Essajee et al, 2017). Early Infant Diagnosis (EID) is part of the infant, maternal, neonatal and child health service package of PMTCT. A properly implemented EID makes it possible for HIV-exposed infants (HEI) to receive early clinical evaluation, prophylaxis for opportunistic infections and antiretroviral therapy (ART) if indicated (WHO, 2010; NACA, 2019).

The World Health Organization (WHO) recommends that infants known to have been exposed to HIV should undergo a virological test for infection at 4 to 6 weeks of age, 6

months or 6 weeks after breastfeeding and 18 months (Onankpa and Tahir, 2014; Ibobo, Nwose and Chime, 2017). In infants born to HIV-infected women, maternal anti-HIV antibodies cross the placenta and persist in the infant blood for up to 18 months. Therefore, when detected in young infants, these antibodies usually represent exposure to maternal HIV rather than true infant HIV infection (Chatterjee, 2011). Antibody-based tests can therefore be accurately used only to exclude infant infection after 12 months of age, or to confirm infant infection after 15-18 months of age (Abiodun, Sotunsa, Ani, Olaleye and Taiwo, 2015). DNA polymerase chain reaction (DNAPCR) test, on the other hand, is used for diagnosing children below 18 months either by using dried blood spot (DBS) or whole blood sample (WBS). The WBS requires sophisticated and expensive equipment, and the samples have to be sent to the laboratory within 24 hours under proper cold chain maintenance, while DBS can be stored and shipped to testing facilities without refrigeration within 15 days. DBS is therefore more user-friendly and cost-effective in resource-limited settings (Violari et al, 2008). The National AIDS Control Organization (NACO) (2010) suggests the use of DBS as a prime test for all the children and if found positive, then to use a WBS as a confirmatory test. DBS is advised for infants below 6 months of age, while for those above 6 months of age, a rapid test is to be done first and the DBS is to be done only if the rapid test is found positive (Violari et al, 2008; Jain, Mahajan, Shevkani, and Kumar 2011).

Antiretroviral therapy (ART) should be initiated upon diagnosis of HIV infection in children aged less than 24 months (WHO, 2010) since the disease progresses rapidly in the first few months of life, often leading to death in infants who acquire HIV at the time of delivery. The exposed child who receives prophylactic antibiotics (Cotrimoxazole) and anti-retroviral therapy (ART) as soon as is medically indicated, has a significant chance of long and healthy survival (Boyle et al, 2013; Braitstein et al, 2011; Ciaranello et al, 2011). Mothers of HIV-exposed infants bear the onus to ensure the survival of their infants, part of which is the compliance with the utilization of EID services available in the healthcare facilities. This study therefore assessed the compliance of mothers of HIV-exposed infants to the uptake of early infant diagnosis services in selected health facilities in Anambra State, Nigeria.

## **METHODOLOGY**

### **Study Area**

This study was carried out in some selected health facilities in Anambra state. Anambra state is located in the South-East, Nigeria. The State covers an area of 4,416sq km and it is situated on rolling flat land on the eastern plains of the River Niger. It shares boundaries with Delta State to the West, Imo State to the South, Enugu State to the East and Kogi State to the North. According to the 2006 National census, the State has a total population of 4,177,828. With an estimated annual growth rate of 2.8%, its population in 2020 was estimated to be 6,503,280. The major occupation of the people is trading and services. The indigenous ethnic groups in Anambra state are the Igbos (98% of the population) and a small population of Igala (2% of the population) who live in the North Western part of the state. There are 1276 public and private owned health facilities; 3 of which are Tertiary (All public owned); 470 Secondary (39 Public, 431 Private); and 803 Primary (631 Public, 172 Private) (NHFR, 2021).

The study was carried out in two tertiary health facilities - Nnamdi Azikiwe University Teaching Hospital, (NAUTH) Nnewi, Chukwuemeka Odimegwu Ojukwu University Teaching Hospital, (COOUTH) Awka; and two secondary health facilities - General Hospital, Onitsha and St Charles Borromeo Specialist Hospital, Nkpor.

## Study Design

This was a cross-sectional descriptive study of mothers of HIV-exposed infants accessing care in selected health facilities in Anambra state.

## Study Population

The study population consists of HIV positive mothers with their exposed infants attending the selected health facilities in Anambra state.

## Inclusion Criteria

HIV positive mothers who accessed ANC/ART/EID services at the health facilities with at least one child under 2 years of age.

## Exclusion Criteria

HIV positive mothers who attended the health facilities but were sick/indisposed at the time this study was carried out.

## Sample Size Determination

The sample size formula for a cross sectional analysis was used to determine the suitable sample size for this study

$$N = \frac{Z^2 P(1-P)}{d^2} \text{ (Naing, Win and Rusli 2006).}$$

Where;

N = Calculated sample size

Z = Normal standard deviate at 95% confidence interval = 1.96 (Naing, Win and Rusli 2006).

d = Degree of accuracy desired, set at 5% which is 0.05 (Pourhoseingholi, Vahedi and Rahimzadeh, 2013)

P= Prevalence of HIV among HIV exposed infants in Nigeria. Using 22.16% as prevalence of HIV amongst HIV exposed infants. (Final vertical transmission rate including during breastfeeding) as provided by UNAIDS (UNAIDS, 2019).

Therefore  $1.00 - P = 0.78$

$P = 0.22$

Therefore, the sample size:

$$N = \frac{1.96^2 * 0.22(1 - 0.78)}{0.05^2}$$

= 263.6 ~ 264.

## Sampling Techniques

The selection of hospitals was based on the minimal monthly HEI/mother pair attendance rates which was ascertained in a preliminary study. The hospitals selected were Nnamdi Azikiwe University Teaching Hospital, (NAUTH), Chukwuemeka Odimegwu Ojukwu University Teaching Hospital, Amaku (COOUTH), General Hospital, Onitsha and St Charles Borromeo Specialist Hospital, Nkpor. The first two were hospitals at the Tertiary level while

the last two were at the secondary level. Their respective PMTCT and ART clinics were accessed after permission had been duly granted.

The allocation of the number of respondents to be studied in the four selected hospitals was based on the patient load for HIV positive mothers/HEI pairs visiting the hospitals for PMTCT and ART services. Preliminary assessment of the selected hospitals showed that the minimum monthly patient load proportions for HIV positive mothers/HEI pair attending clinics at NAUTH, COOUTH, General Hospital Onitsha and St Charles Borromeo were 100, 90, 50 and 40 respectively. Therefore, the 264 respondents were recruited into the study from the selected hospitals using proportionate allocation based on the ratio of 10:9:5:4. Therefore, 94 participants were recruited from NAUTH, 85 from COOUTH, 47 from General Hospital Onitsha and 38 from St. Charles Borromeo Hospital, Nkpor.

### **Study Instrument and Data Collection**

An interviewer-administered Questionnaire adapted from Quality Assurance Project format used in a study in Jamaica (Harvey and Thame, 2004); and pre-tested at the PMTCT and ART Unit of the Federal Medical Centre, Asaba, Delta state was used to collect information from the respondents.

### **Measurement of Variables / Data Analysis**

The dependent variable for the study was compliance to early infant diagnosis while the independent variables were the factors that influence this. Mothers who presented their HEI for early infant diagnosis within the recommended timelines were said to be compliant while those who did not were said to be non-compliant.

The collected data was inspected for any data collection or coding errors and then entered into the International Business Machines-Statistical Package for Social Sciences (IBM-SPSS) version 27 for analysis. Frequency distribution of all relevant variables was developed. Means and proportions were calculated while associations between variables were tested using Chi-Square test, Fishers exact test, and t test as appropriate. Level of statistical significance was set at  $p\text{-value} \leq 0.05$  for all inferential analysis and standard deviations.

### **Ethical Consideration**

Ethics committee clearance and approval for this study was sought for and obtained from the Nnamdi Azikiwe University Teaching Hospital Institutional Research Ethics Review Committee, before the commencement of the study. Permission was also obtained from the various heads of the health facilities used in this study. In addition, written informed consent was obtained from the mothers. All data obtained were treated with utmost confidentiality and only for the purpose of this research.

## **RESULTS**

The questionnaires were interviewer-administered to 264 respondents that met with the inclusion criteria at the selected health facilities in Anambra State. This was to extract information necessary to assess compliance of the respondents to the utilization of EID services at the selected health facilities in Anambra State.

**Table 1: Sociodemographic Characteristics of the Respondents**

Variable		Frequency	Percent
<b>Age of Mothers (years)</b>	17-20	4	1.5
	21-30	114	43.2
	31-40	122	46.2
	41 above	24	9.1
<b>Mean Age</b>		31.21 ± 5.3	
<b>Mothers Educational Level</b>	Tertiary	77	29.2
	SSS	143	54.2
	JSS	19	7.2
	Primary	24	9.1
	None	1	0.4
<b>Marital Status</b>	Separated	2	0.8
	Married	242	91.7
	Single	9	3.4
	Widowed	11	4.2
<b>Religion</b>	Catholic	124	47.0
	Pentecostal	61	23.1
	Anglican	70	26.5
	Others	9	3.4
<b>Fathers Educational Level</b>	Tertiary	32	12.1
	SSS	145	54.9
	JSS	18	6.8
	Primary	40	15.2
	None	9	3.4
	Missing	20	7.6
<b>Residence</b>	Urban	148	56.1
	Rural	116	43.9

The respondents had a mean age of 31.2 ± 5.3 years and were mostly married.

**Table 2: The performance of respondents on a test to test basis**

COMPLIED			
	Yes	No	Total
Respondents attending for First test			80
Compliance in First Test	67(83.8%)	13(16.3%)	80 (100%)
Respondents attending for Second Test			92
Compliance in First Test	91 (98.9%)	1 (1.1%)	92 (100%)
Compliance in Second Test	92 (100%)	0 (0%)	92 (100%)
Respondents attending for Third Test			92
Compliance in First Test	87 (94.6%)	5 (5.4%)	92 (100%)
Compliance in Second Test	84 (91.3%)	8 (8.7%)	92 (100%)
Compliance in Third Test	85 (92.4%)	7 (7.6%)	92 (100%)
Grand Total			264(100%)

Compliance was higher amongst respondents attending for the second test.

**Table 3: The compliance of Respondents to Laboratory tests**

LAB TEST	Mother/Infant Pairs		
	Complied	Not Complied	Total
1st (6 weeks)	245(92.8%)	19(7.2%)	264
2nd (6months/6weeks after breastfeeding)	176 (95.7%)	8 (4.3%)	184
3rd (18months)	87 (94.6%)	5 (5.4%)	92

The data here shows the results of mother/infant pairs interviewed in the clinics during their visits for follow up appointments for HEIs accessing care for drug refills and laboratory testing for HEIs. The respondents comprised of mother/infant pairs attending clinics for the first test at six weeks, second test at 6 months or 6 weeks after breast feeding and third test at 18 months. All respondents had attended the first test at least and most were compliant.

**Table 4: The duration taken for HEI to obtain results of HIV testing**

Test	Duration	Frequency	Percent
First Test	1-2weeks	6	2.4
	3-4weeks	5	2
	>1month	244	95.7
	Total	255	100
Second Test	1-2weeks	6	3.9
	3-4weeks	4	2.6
	>1month	145	93.5
	Total	155	100
Third Test	1-2weeks	76	87.4
	3-4weeks	11	12.6
	Total	87	100

Results from EID tests were typically returned to the health facilities after 1 month from the time samples were taken.



**Table 5: Compliance of Respondents to Oral Prophylaxis use**

Exposed Infants	Oral Prophylaxis	
	Nevirapine	Cotrimoxazole
Received	258(97.7%)	229(87%)
Not Received	6(2.3%)	35(13%)
Total	264(100%)	264(100%)

There was high compliance to taking oral prophylaxis among respondents to this study. Only one of two positive infants received ART treatment during the cascade period. The infant that received ART became positive after the results of the first test were received. The other infant did not receive ART treatment because the mother did not know her status and the infant was only identified to be positive at 18months.

**Table 6: Reasons for non-compliance with testing at specified times**

Reasons above 6 weeks	Frequency	Percent
Busy	4	11.8
Unaware	4	11.8
Forgot	7	20.6
Illness	2	5.9
Mother did not know status	4	11.8
Staff Issues	3	8.8
Trauma from loss of child	1	2.9
COVID	1	2.9
Traveled from base	8	23.5
Total	34	100

Travel from base was seen to be the most influential of all while trauma from loss of child and COVID were the least influential reasons.

**Table 7: Factors that affect the compliance of mothers of HEIs to early infant diagnosis services in selected health facilities in Anambra State.**

		Time of first test			Fishers Exact	p-Value
		At 6 weeks	Above 6 weeks	Total		
Marital Status	Single	7(77.8)	2(22.2)	9(100)	5.55	0.14
	Separated	2(100)	0(0.0)	2(100)		
	Married	227(93.8)	15(6.2)	242(100)		
	Widowed	9(81.8)	2(18.2)	11(100.0)		
Mothers Highest Education	None	1(100)	0(0)	1(100)	0.28	0.99
	JSS	18(94.7)	1(5.3)	19(100)		
	Tertiary	71(92.2)	6(7.8)	77(100)		
	Primary	22(91.7)	2(8.3)	24(100)		
	SSS	133(93.0)	10(7.0)	143(100)		
Religion	Anglican	67(95.7)	3(4.3)	70(100)	2.87	0.41
	Pentecostal	54(88.5)	7(11.5)	61(100)		
	Catholic	116(93.5)	8(6.5)	124(100)		
	Other	8(88.9)	1(11.1)	9(100)		
Mothers occupation	Trading	122(93.1)	9(6.9)	131(100)	3.31	0.77
	Artisan	38(92.7)	3(7.3)	41(100)		
	Student	9(100)	0(0)	9(100)		
	Civil Servant	16(94.1)	1(5.9)	17(100)		
	Teaching	15(83.3)	3(16.7)	18(100)		
	Unemployed	44(93.6)	3(6.4)	47(100)		
Fathers Highest Education	Missing	18(90)	2(10)	20(100)	3.78	0.58
	None	8(88.9)	1(11.1)	9(100)		
	JSS	18(100)	0(0)	18(100)		
	Tertiary	30(93.8)	2(6.3)	32(100)		
	Primary	35(87.5)	5(12.5)	40(100)		

	SSS	136(93.8)	9(6.2)	145(100.0)		
Occupation Father	Missing	14(100)	0(0)	14(100)	4.79	0.57
	Trading	98(94.2)	6(5.8)	104(100)		
	Artisan	64(87.7)	9(12.3)	73(100)		
	Civil Servant	20(95.2)	1(4.8)	21(100)		
	Teaching	2(100)	0(0)	2(100)		
	Unemployed	1(100)	0(0)	1(100)		
	Other	46(93.9)	3(6.1)	49(100)		
	Residence	Rural	107(92.2)	9(7.8)	116(100)	0.10
Urban		138(93.3)	10(6.8)	148(100)		

None of the sociodemographic variables affected the compliance of mothers of HEIs to early infant diagnosis services in selected health facilities in Anambra State

## DISCUSSIONS

It is of utmost importance that HIV positive mothers comply with guidelines for prevention of mother to child transmission of the virus as non-compliance of these mothers to EID services is the bane of efforts by stakeholders toward the elimination of mother-to-child transmission of HIV.

High compliance to EID testing was observed among the respondents in this study. Participants in this study showed more compliance (92.8% for the first test, 95.7% for the second test and 94.6% for the third test) to laboratory testing when compared to the study by Anaba et al (2019) which was 75%. However, there was no significant difference between results obtained in this study and results obtained by Anaba et al (2019) ( $X^2 = 2.84$ ,  $p = 0.09$ ) and Diaz et al (2022) ( $X^2 = 0.27$ ,  $p = 0.60$ ). Exposure to the mentor mother support system as seen in the study by Sam-Agudu et al (2017) and Anaba et al (2019) may have been a reason for high compliance observed in presenting infants for the tests at specified times. The high compliance to EID services as was observed in this study suggests that stakeholders' interventions in ensuring the elimination of mother to child transmission of HIV are productive in Anambra State. Delays in receiving the test results however points towards a possible inadequacy of available resources, logistics and manpower in the health management system.

High compliance to the intake of oral prophylaxis (Nevirapine and Cotrimoxazole) was also observed in this study. Two hundred and fifty-eight (97.7%) HEIs started receiving oral prophylaxis at birth. This was higher than Nwaiwu et al (2019) observed in Lagos state where only 85.2% took the prescribed medications and Napyo et al (2022) observed where 85.2% were adherent to NVP prophylaxis. Results from this study differ from those of Nwaiwu et al (2019) ( $X^2 = 17.26$ ,  $p < 0.00$ ) and Napyo et al (2022) ( $X^2 = 27.49$ ,  $p < 0.00$ ). 87% of the respondents received Cotrimoxazole in this study. This is also an indication of effectiveness of interventions by stakeholders. However, total adherence is required for good clinical outcomes.

It was observed that the mean TAT from collection of samples to the mother/infant pairs being notified was over 30 days in 244 (95.2%) of 255 cases for the first test and 145 (93.5%) of 155 cases for the second test. It took a generally shorter time to receive results of the third test as 76 (87.4%) of 87 respondents received results in 1-2 weeks. Milanzi et al (2020), Bianchi et al (2019) and Tiam et al (2017) each observed over 30 days TAT. Wexler et al (2017) observed less than 30 days as the TAT in Kenya. However, there were no differences between results obtained in this study and Wexler et al (2017), Milanzi et al (2020), Tiam et al (2017) and Bianchi et al (2019). The lapses witnessed here are system-inherent issues as there have been reports of inadequate number of central laboratories in the region serving the selected health facilities. Transportation of samples to the central laboratories and back to the originating sites were almost flawless in execution as a rider picked DBS samples twice a week from the health facilities assessed.

The study found that socio-demographic variables like maternal education and religion did not significantly affect the compliance of mother/infant pairs to early infant diagnosis (EID) services but the presence of mentor-mother support increases the likelihood of EID uptake compared to routine peer support as was observed in this study. The lack of significant impact of maternal education and religion on compliance suggests that interventions focusing solely on these aspects may not effectively improve adherence to early infant diagnosis services.

Travel from base to other locations, forgetfulness, being busy, not being aware of the proper time for test, mothers not knowing their status, dissatisfaction with clinic programs and staff, and nurses unavailability were identified as reasons for non-compliance among mother/infant pairs. Travel from base to other locations emerged as a significant contributor to delayed presentation. It could be travel for child birth as some respondents mentioned desiring traveling to the village for child birth as their preference or traveling for other reasons. Inconsistent human resources for sample collection negatively impact compliance with EID as was observed in this study was also pointed out by Sam-Agudu et al (2017) as it can cause discouragement in program participation especially when there are delays in being notified of the result from the tests. Dissatisfaction with clinic programs and staff was also observed by Coulibaly et al (2014). Inasmuch as some mother/infant pairs cited dissatisfaction with the staff and clinic programs as reasons for non-compliance, it was observed that there was confidential counselling available at the selected hospitals and hence reduced the risk of stigmatization against positive mothers and their infants within the facility. This should have increased compliance, therefore there may be other reasons why non-compliant mother/infant pairs did not come for the test when required. These reasons have shown the loose ends where more interventions are required.

Mothers aware of their HIV status before childbirth were more likely to present their infants for the first test at 6 weeks. It is therefore important that pregnant women are tested for HIV and when identified as positive, counselled regarding guidelines to follow to ensure their infants are free of the virus and placed on Antiretroviral Therapy.

There was no significant association between attending Antenatal care and presenting infants for EID test. This could be because there was no health education regarding HIV and prevention of mother to child transmission of HIV during general ANC proceedings as the topic was deemed sensitive since it could promote stigmatization. However, as is evident from findings in this study, this did not affect the overall compliance.

The number of children the respondents had since knowing their status had a negative correlation with compliance to timing for the first test. It was observed that as the number of children of the respondents increased since knowing their status, presenting their infants for the first test reduced. This trend may be because they feel they have had sufficient knowledge in caring for an exposed infant or that there was an increasing fear of being identified as a HIV patient hence increasing the chances of being stigmatized.

Findings from this study show that mother/infant pairs visiting the selected health facilities were typically not informed of the outcome of their test except in cases where the infant's status was positive. When such is the case, the mother's provided phone number is reached or the contact address is visited by the case managers. While this practice did not adversely influence compliance as is seen in the study, notification of results would likely increase faith in the system and its effectiveness amongst the patients.

There were two positive infants in this study (0.8%). One was discovered to be positive when result from the first test was received while the other positive infant was discovered to be positive upon receipt of result from the third test at 18 months. This was much lower than Searo's (2018) observation (13 HEIs [3.8%]) and 10 (2%) observed by Milanzi et al (2020). Both positive infants in this study were placed on ART within 24 hours of receiving results. The same was observed by Searo (2018) and Milanzi et al (2020) in which every positive infant was placed on ART. This shows the effectiveness of the result notification system within the selected health facilities. Only one of two positive infants received ART treatment during the cascade period. The infant that received ART was known to be positive after the results of the first test were received. This is similar to Adelekan et al (2022) reporting that all 68 positive infants received ART. The other infant did not receive ART treatment during the cascade period because the mother did not know her status therefore no testing was done until the child became consistently ill after 18 months.

By addressing the broader determinants as was observed in other studies while simultaneously targeting the specific barriers highlighted in this study, healthcare systems and policymakers can develop comprehensive approaches that promote timely EID uptake, thereby enhancing the well-being of HIV-exposed infants and optimizing their chances of receiving necessary care and treatment.

## **CONCLUSION**

This study showed that that socio-demographic factors such as maternal education and religion did not significantly influence the adherence of mother/infant pairs to early infant diagnosis (EID) services at selected health facilities in Anambra State. Participants in the study demonstrated higher rates of compliance compared to reviewed studies. Factors contributing to non-adherence among mother/infant pairs included travel from their base to other locations, forgetfulness, busy schedules, lack of awareness of the correct test times, mothers not knowing their HIV status, dissatisfaction with clinic programs and staff, and unavailability of nurses. Mothers who were aware of their HIV status before childbirth were more likely to bring their infants for the first test at 6 weeks. However, the number of children a mother had since becoming aware of her status seemed to be associated with decreased adherence to laboratory testing, indicating varying levels of information among mothers.

## RECOMMENDATIONS

The following are the recommendations to enhance early infant diagnosis (EID) of HIV and improve compliance with EID services:

1. Building on the positive impact observed from mentor mother support programs, healthcare facilities should invest in and expand such initiatives. Mentor mothers can play a pivotal role in educating and encouraging caregivers to adhere to EID schedules, promoting awareness, and addressing concerns.
2. Addressing specific barriers like dissatisfaction with clinic programs, and not being aware of HIV status is essential. Counseling services should focus on mitigating stigma, improving program satisfaction, and offering practical solutions to overcome travel or availability issues.
3. Efforts should be made to minimize the turnaround time (TAT) for test results as efficient communication of results to mother/infant pairs is crucial to maintain engagement and ensure timely follow-up actions. Address challenges related to test kit availability and turnaround time by improving the capacity of central laboratories and optimizing supply chains. Adequate resources, efficient transportation, and timely distribution of test kits are essential to ensure consistent and reliable testing services.
4. Recognize the varying levels of knowledge and information among mothers. Provide tailored counseling sessions that address individual needs, preferences, and concerns. Ensuring mothers are well-informed about their HIV status, testing protocols, and infant care will empower them to make informed decisions.

## REFERENCES

- Abiodun O, Sotunsa J, Ani F, Olaleye A, Taiwo A. (2015). Elimination of Mother-To-Child Transmission of HIV in Nigeria: The Roles, Preparedness and Determinants of Successful Involvement of Traditional Birth Attendants. *J AIDS Clin Res* 6: 481. doi:10.4172/2155-6113.1000481
- Adelekan B, Harry-Erin B, Okposo M, Aliyu A, Ndembi N, Dakum P, Sam-Agudu NA. Final HIV status outcome for HIV-exposed infants at 18 months of age in nine states and the Federal Capital Territory, Nigeria. *PLoS One*. 2022 Feb 14;17(2):e0263921. doi: 10.1371/journal.pone.0263921. PMID: 35157737; PMCID: PMC8843197.
- Anaba U, Sam-Agudu N, Ramadhani H, Torbunde N, Abimiku A, Dakum P, et al. (2019). Missed opportunities for early infant diagnosis of HIV in rural North-Central Nigeria: A cascade analysis from the INSPIRE MoMent study. *PLoS ONE*. 14(7): e0220616. <https://doi.org/10.1371/journal.pone.0220616>
- Avert. Prevention of Mother-To-Child Transmission (PMTCT) Of HIV. [www.avert.org/professionals/hiv-programming/prevention/prevention-mother-child](http://www.avert.org/professionals/hiv-programming/prevention/prevention-mother-child). Accessed November, 2019

- Bianchi F, Cohn J, Sacks E, Bailey R, Lemaire JF, Machekano R, et al. (2019). Evaluation of a routine point-of-care intervention for early infant diagnosis of HIV: an observational study in eight African countries. *The lancet HIV*. Jun 1;6(6):e373-81.
- Boyle D, Lehman D, Lillis L, Peterson D, Singhal M, Armes N et al. (2013). Rapid detection of HIV-1 proviral DNA for early infant diagnosis using recombinase polymerase amplification. *MBio*. Apr 2;4(2) pii: e00135-13.
- Braitstein P, Songok J, Vreeman R, Wools-Kaloustian K, Koskie P, Walusunat L, et al. (2011). Outcomes of HIV-positive and HIV exposed children lost to follow-up from a large HIV treatment program in western Kenya. *J Acquir Immune Defic Syndr*.57(3):40-46.
- Bwana V, Frimpong C, Simulundu E, Mfinanga S, Mboera L and Michelo C. (2016). Accessibility of services for early infant diagnosis of Human Immunodeficiency Virus in sub-Saharan Africa: a systematic review. *Tanzania Journal of Health Research*.18:3.<http://dx.doi.org/10.4314/thrb.v18i3.9>
- Chatterjee A, Tripathi S, Gass R, Hamunime N, Panha S, Kiyaga C, et al. (2011). Implementing services for Early Infant Diagnosis (EID) of HIV: a comparative descriptive analysis of national programs in four countries. *BMC Public Health*. Jul 13; 11:553. doi: 10.1186/1471-2458-11-553
- Ciaranello A, Park J, Ramirez-Avila L, Freedberg K, Walensky R and Leroy V. (2011). Early infant HIV-1 diagnosis programs in resource-limited settings: opportunities for improved outcomes and more cost-effective interventions. *BMC Medicine*. 9:59. doi:10.1186/1741-7015-9-59
- Coulibaly, M., Meda, N., Yonaba, C., Ouedraogo, S., Congo, M., Barry, M. et al. (2014). Missed Opportunities for Early Access to Care of HIV-Infected Infants in Burkina Faso. *PLoS ONE*. 9.10, e111240. <https://doi.org/10.1371/journal.pone.0111240>
- Díaz G, Paulo P, Yu Z, Moiane S, Silva W, Bravo M, Alvim MF, Cugara C, Wester CW. (2022). PMTCT cascade and linkage to ART among HIV-exposed infants (HEI) in the Namacurra Sede-Zambézia Province, Mozambique.
- Essajee S, Bhairavabhotla R, Penazzato M, Kiragu K, Jani I, Carmona S et al. (2017). Scale-up of Early Infant HIV Diagnosis and Improving Access to Pediatric HIV Care in Global Plan Countries: Past and Future Perspectives. *Journal for Acquired Immune Deficiency Syndrome*.75:S51–S58
- Harvey K and Thame I. (2004). The impact of a programme to prevent mother-to-child transmission of HIV: disease transmission and health-seeking behaviour among HIV-positive mother-child pairs in Jamaica. Operations research results. Bethesda, MD: Quality Assurance Project for USAID. Nov:5-9. Available on [www.qaproject.org/pubs/PDFs/JamaicaPMTCTscreen.pdf](http://www.qaproject.org/pubs/PDFs/JamaicaPMTCTscreen.pdf). Accessed on 23/3/21
- HIV.gov (2023). What are HIV and AIDS? <https://www.hiv.gov/hiv-basics/overview/about-hiv-and-aids/what-are-hiv-and-aids/> Accessed February 23, 2024.

- Ibobo J, Nwose E, Chime H. (2017). Reducing the mother-to-child transmission of HIV: findings from an early infant diagnosis program in Delta state Nigeria. *Int J Community Med Public Health*;4:4352-7.
- Jain K, Mahajan R, Shevkani M, and Kumar P. (2011). Early Infant Diagnosis: A New Tool of HIV Diagnosis in Children. *Indian J Community Med*. Apr-Jun; 36(2): 139–142.
- Milanzi E, Mwapasa V, Joseph J, Jousset A, Tchereni T, Gunda A et al. (2020). Receipt of infant HIV DNA PCR test results is associated with a reduction in retention of HIV-exposed infants in integrated HIV care and healthcare services: a quantitative sub-study nested within a cluster randomised trial in rural Malawi. *BMC public health*. Dec;20(1):1-4.
- NACA Annual Report 2021. Nigeria: National Agency for the Control of AIDS; 2021
- Naing L, Win T and Rusli BN. (2006). Practical issues in calculating the sample size for prevalence studies. *Arch Orofacial Sci*.1:9-14
- Napyo A, Tylleskär T, Mukunya D, Tumuhanye J, Musaba MW, Ojok Arach AA, Waako P, Tumwine JK, Ndeezi G (2020). Barriers and enablers of adherence to infant nevirapine prophylaxis against HIV 1 transmission among 6-week-old HIV exposed infants: A prospective cohort study in Northern Uganda. *PLoS One*. Oct 15;15(10):e0240529. doi: 10.1371/journal.pone.0240529. PMID: 33057393; PMCID: PMC7561159.
- National Agency for Control of Aids. (2019). Revised national HIV and AIDS strategic framework 2019-2021: Future directions for HIV/AIDS response in Nigeria. Available on <https://naca.gov.ng/revised-national-hiv-and-aids-strategic-framework-2019-2021>. Accessed on March 12, 2021
- National Agency for Control of AIDS. Director General Press briefing on World AIDS day (2023). <https://naca.gov.ng/dg-nacas-speech-at-world-aids-day-commemoration-service/> Date Accessed February 20, 2024.
- National AIDS Control Organization. (2010). Guidelines for Care of HIV exposed infants and children less than 18 months. Jan, NACO,; pp. 24–36. Available on <http://www.upsacs.in/pdf/GUIDELINES/pptct%20Draft%20Guidelines%20on%20Care%20of%20HIV%20Exposed%20Infant%20%20and%20Child%20less%20than%2018%20Months%2025-1-10.pdf>. Accessed on November 30, 2019.
- Nigeria Health Facility Registry [Internet]. Federal Ministry of Health [cited 2021 Feb 17]. Available from: [https://hfr.health.gov.ng/facilities/hospitals-search?token=rBZA8F5dgQm4N0tGxTFCwoWw6eFg0dJvw1ed1Ns&state\\_id=104&ward\\_id=0&facility\\_level\\_id=0&ownership\\_id=0&operational\\_status\\_id=1&registration\\_status\\_id=0&license\\_status\\_id=0&geo\\_codes=0&service\\_type=0&service\\_category\\_id=0&entries\\_per\\_page=20&page=64](https://hfr.health.gov.ng/facilities/hospitals-search?token=rBZA8F5dgQm4N0tGxTFCwoWw6eFg0dJvw1ed1Ns&state_id=104&ward_id=0&facility_level_id=0&ownership_id=0&operational_status_id=1&registration_status_id=0&license_status_id=0&geo_codes=0&service_type=0&service_category_id=0&entries_per_page=20&page=64)
- Nkwo PO. (2012). Prevention of mother to child transmission of human immunodeficiency virus: The Nigerian perspective. *Ann Med Health Sci Res*;2:56-65.
- Nwaiwu O, Olatunde FA, Harrison NE, Ilomuanya MO, Oduniyi OA. (2019). Evaluation of Adherence to Nevirapine for Prevention of Mother-to-Child Transmission amongst Infants of



- HIV Positive Mothers in the First 6 Weeks of Life in Lagos Nigeria. *World Journal of AIDS*. Jun 3;9(2):70-84.
- Oleribe OO, Enenche E, Udofia D, Ekom E, Osita-Oleribe PI, Kim JU et al. (2018). Assessment of the effectiveness of PMTCT program in eight service delivery points in North Central Nigeria. *Hiv/aids* (Auckland, NZ);10:253.
- Onankpa B and Tahir Y. (2014). PCR pattern of HIV-exposed infants in a tertiary hospital. *Pan African Medical Journal*.18(345). doi:10.11604/pamj.2014.18.345.3713.
- Pourhoseingholi, MA, Vahedi M and Rahimzadeh M. (2013). Sample size calculation in medical studies. *Gastroenterology and Hepatology from bed to bench*.;6(1):14.
- Sam-Agudu, N., Ramadhani, H., Isah, C., Ereka, S., Fan-Osuala, C., Anaba, U., et al. (2017). The impact of structured mentor mother programs on presentation for early infant diagnosis testing in Rural North-Central Nigeria: A Prospective Paired Cohort Study, *JAIDS Journal of Acquired Immune Deficiency Syndrome*..75:S182-S189. DOI: 10.1097/QAI.0000000000001345
- Searo HG. (2018). Update on antiretroviral regimens for treating and preventing HIV infection and update on early infant diagnosis of HIV policy brief HIV treatment-interim guidance. World Health Organization.
- The Cable (2023).Commissioner: Over 98,000 living with HIV in Anambra | Only 58% know their status. <https://www.thecable.ng/commissioner-over-98000-living-with-hiv-in-anambra-only-58-know-their-status>. Accessed February 20, 2024.
- Thiha S., Shewade H.D., Philip S., Aung T., Kyaw N., Minn M. et al. (2017). Factors associated with long turnaround time for early infant diagnosis of HIV in Myanmar, *Global Health Action*..10:1, 1395657, DOI: 10.1080/16549716.2017.1395657
- Tiam A, Gill MM, Hoffman HJ, Isavwa A, Mokone M, Foso M et al. (2017). Conventional early infant diagnosis in Lesotho from specimen collection to results usage to manage patients: Where are the bottlenecks? *PLoS One*. Oct 10;12(10):e0184769.
- UNAIDS (2019) Global HIV & AIDS statistics — 2019 fact sheet. <https://www.unaids.org/en/resources/fact-sheet> Accessed 22<sup>nd</sup> October, 2019
- UNAIDS. (2021). Global HIV & AIDS Statistics — 2021 Fact Sheet.
- UNAIDS. *Fast Track. Ending the AIDS epidemic by 2030*. Geneva. 2014;1-40. [https://www.unaids.org/en/resources/documents/2014/JC2686\\_WAD2014report](https://www.unaids.org/en/resources/documents/2014/JC2686_WAD2014report). Accessed 22<sup>nd</sup> October, 2019
- Violari A, Cotton M, Gibb D, Babiker A, Steyn J, Madhi S, et al. (2008). CHER Study Team. Early antiretroviral therapy and mortality among HIV-infected infants. *N Engl J Med*. Nov 20; 359(21):2233-44. <http://dx.doi.org/10.1056/NEJMoa0800971>
- World Health Organization.(2010).PMTCT strategic vision 2010–2015: preventing mother-to-child transmission of HIV to reach the UNGASS and Millennium Development Goals. Available from: [http://www.who.int/hiv/pub/mtct/strategic\\_vision.pdf](http://www.who.int/hiv/pub/mtct/strategic_vision.pdf). Accessed on November 2, 2019.