

Health system factors influencing timely uptake of polymerase chain reaction (PCR) test for HIV exposed infants in Apac General Hospital in Apac. A cross-sectional study.

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ABSTRACT

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Background:

Health system factors play a critical role in determining whether HIV-exposed infants receive timely polymerase chain reaction (PCR) testing. To assess health system factors influencing timely taking of PCR for HIV exposed infants at Apac General Hospital in Apac district-Uganda

Methodology:

A descriptive cross-sectional study design was employed, involving 32 HIV-positive mothers with infants aged 1–18 months in EID departments at Apac General Hospital. Data were collected using structured questionnaires and analysed using descriptive statistics in Microsoft Excel, presented in tables, charts, and figures.

Findings:

The majority of respondents were 31 years and above, 31.3% (10), and only 15.6% (05) were aged 15–19 years. 62.5% (20) had received reminders through SMS, phone calls, or home visits for their infant's PCR testing, while 37.5% (12) had not. Most respondents of 93.8% (30) reported that PCR testing services and supplies were consistently available, while only 6.2% (2) experienced shortages. 43.8% (14) walk about 5-10 kilometres to the health facility, and only 21.8% (7) walk a distance less than 1 Kilometer. 65.6% (21) always get information about PCR from health workers, and only 6.3% (2) rarely get information on PCR testing at the facility.

Conclusion:

Availability of test kits, effective communication, and reminder systems promote uptake, though distance still limits access.

Recommendations:

Strengthen integration of PCR testing with routine maternal-child health services.

Keywords: Timely taking of PCR, HIV exposed infants, Apac General Hospital.

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Background

Health system factors play a critical role in determining whether HIV-exposed infants receive timely polymerase chain reaction (PCR) testing. Availability and accessibility of healthcare services are major determinants. Studies in Uganda and Kenya indicate that long distances to health facilities and high transportation costs significantly reduce timely uptake of PCR testing among HIV-exposed infants (Masereka et al., 2020b; Gaitho et al., 2021). In rural areas, mothers living more than 5 kilometres from a health facility are less likely to adhere to recommended testing schedules compared to those living closer (Masereka et al., 2020b). Similarly, a scoping review in Tanzania highlighted that the unavailability of test kits and logistical challenges at health facilities negatively affect early infant diagnosis uptake (Metta & Tesha, 2023).

Healthcare worker factors also influence service utilisation. Positive interactions with supportive, respectful, and non-judgmental staff increase mothers' likelihood of bringing infants for timely PCR testing

(Mboya et al., 2020b). Conversely, lack of adequate information, misinformation, or negative attitudes from providers discourages attendance and contributes to missing opportunities for early infant diagnosis (Mboya et al., 2020b). These findings underscore the importance of training healthcare workers to provide consistent, accurate, and empathetic guidance to mothers. System-level interventions, such as appointment reminders and follow-up mechanisms, improve adherence to PCR testing schedules. In Uganda, mothers who received mobile phone reminders were significantly more likely to attend PCR testing appointments than those who did not receive reminders (Masereka et al., 2020b). Similarly, in North Ethiopia, mobile phone reminders increased timely PCR uptake by 20% among HIV-exposed infants (Ebuy et al., 2020). Home visits and follow-up by healthcare workers or community health workers have also proven effective, helping mothers navigate logistical challenges, reinforcing the importance of testing, and providing transportation or

guidance when needed (Izudi et al., 2017; Gaitho et al., 2021).

Clinical factors related to maternal health also affect timely testing. Research in Tanzania shows that infants born to mothers with advanced HIV disease (WHO stage II–IV) were less likely to receive early testing than those born to mothers with stage I disease, possibly due to higher maternal morbidity and challenges in attending healthcare appointments (Mboya et al., 2020a). Additionally, receipt of prophylaxis, such as nevirapine, has been linked to increased likelihood of early testing, suggesting that integrated maternal-infant care services promote adherence to recommended schedules (Mboya et al., 2020a).

Finally, routine health information systems may underestimate uptake of early infant diagnosis, highlighting the need for robust monitoring and evaluation. A study in Zimbabwe revealed that over two-thirds of infants had no documented early infant diagnosis by three months of age, indicating gaps in record-keeping and potential missed opportunities for timely testing (Webb et al., 2020). Strengthening health information systems, ensuring consistent availability of test kits, improving healthcare worker attitudes, and implementing reminder systems are essential strategies to enhance early infant diagnosis coverage in Uganda and similar rural contexts.

In summary, health system factors—accessibility of services, healthcare worker competence and attitude, appointment reminders, follow-up interventions, maternal health status, and functional health information systems—are critical in ensuring timely PCR testing for HIV-exposed infants. Addressing these factors through targeted interventions will improve early infant diagnosis uptake, facilitate prompt initiation of antiretroviral therapy, and reduce mother-to-child transmission of HIV. The study aims to assess health system factors influencing timely taking of PCR for HIV exposed infants at Apac General Hospital in Apac district, Uganda.

METHODOLOGY

Study Design and Rationale

The study was a descriptive cross-sectional design to assess factors influencing the timely uptake of the first PCR test among HIV-exposed infants at Apac General Hospital. This design was suitable because it allows the simultaneous evaluation of multiple variables and provides a snapshot of current circumstances regarding PCR uptake among HIV-exposed infants.

Study Setting and Rationale

The study was conducted at Apac General Hospital (AGH) in Apac District, Northern Uganda. Apac District lies approximately at a latitude of 2.098837, a longitude of 33.33332322, and an altitude of 1138.2 meters above sea level. Oyam District borders it to the north, Kole District to the west, Lira District to the south, and Kwana District to the east. The district headquarters are

located about 62 kilometres north of Lira City and approximately 310 kilometres by road north of Kampala, Uganda's capital.

Apac General Hospital serves a catchment population of around 20,000 people from various parishes, including Arocha, Atopi, Akere, and Abedi, as well as Apac Town Council. The facility offers outpatient consultations, inpatient admissions, immunisation programs, laboratory diagnostics, and a high-volume antenatal clinic serving an average of 80 pregnant and breastfeeding women daily, many of whom are HIV-positive. The high patient load and comprehensive maternal-child health services make AGH an ideal setting for this study.

Study Population

The study population included HIV-exposed infants aged 1–18 months receiving care at Apac General Hospital.

Sample Size Determination

Given the finite population of 35 HIV-exposed infants, the sample size was determined using Morgan and Krejcie's (1970) table, which corresponds to 32 participants.

For pretesting, 7.5% of the sample size was used:

$$\text{Pretesting Number} = 7.5\% \times 32 = 2$$
$$2 \text{ Pretesting Number} = 7.5\% \times 32 = 2$$

Thus, 2 participants will be involved in the pretest to refine study instruments before full implementation with the remaining 32 participants.

Sampling Procedure

ART registers at the postnatal clinic will be reviewed to identify HIV-positive breastfeeding mothers with HEIs aged 1–18 months. Mothers and infants were listed in an Excel sheet, and participants will be randomly selected from this list. Interviews were conducted during scheduled clinic visits. For mothers who miss appointments, Village Health Teams (VHTs) and peer mothers will assist in follow-up home visits for data collection.

Inclusion Criteria

Mothers of HIV-exposed infants aged 1–18 months who were willing to provide informed consent.

Exclusion Criteria

HIV-exposed infants aged 1–18 months whose caregivers were critically ill or unable to respond to the questionnaire.

Study Variables

Independent Variables:

Health system factors

Dependent Variable:

Timely uptake of the first PCR test among HIV-exposed infants at AGH

Research Instruments

Data were collected using structured questionnaires, administered by trained research assistants. The questionnaires gathered information on socio-demographics, client-related factors, community factors, and health system factors influencing timely PCR testing.

Data Collection Procedure

Structured interviews with both open- and closed-ended questions in English were conducted by the principal investigator and trained research assistants. Training will focus on ethical conduct, accurate administration of the questionnaire, and proper handling of sensitive information. Respondents will personally complete the questionnaire under supervision.

Data Management

Completed questionnaires were reviewed daily for completeness and accuracy before data entry. Data were entered into a secure, password-protected database. Quality control measures, including double-checking and consistency reviews, will be applied. Both paper and electronic data will be stored securely with access restricted to authorised personnel. Confidentiality will be maintained, and only aggregate data will be reported.

Data Analysis

Data were analysed using Microsoft Excel. Descriptive statistics will be presented using tables, charts, and

graphs, while qualitative information will be summarised narratively. Key themes will align with the study objectives.

Ethical Considerations

Approval

Ethical clearance will be obtained from the Research Committee at Florence Nightingale School of Nursing and Midwifery, along with administrative approval from the District Health Office in Apac.

Informed Consent

Written informed consent was obtained from all participants after explaining the study objectives in a language they understood.

Privacy and Confidentiality

Interviews were conducted in private settings. Data will be anonymised, coded, and stored securely to ensure confidentiality.

RESULTS

Socio-demographic characteristics

This study achieved a 100% response rate. The majority of respondents were 31 years and above, 31.3% (10), and only 15.6% (05) were aged 15–19 years. Out of these participants, 65.6% (21) were married, while at least 6.3% (2) were widowed. Less than half, 34.4% (11), had two children; moreover, up to 12.5% (4) had at least three children. At least up to 31.3% (10) of respondents had attained tertiary education, though up to 18.7% (6) had primary education only. Most of these participants, 40.6% (13), were farmers, while only 12.5% (4) were civil servants.

Table 1: socio-demographic characteristics of respondents (n=32)

Variables	Frequency	Percentages
Age Group		
15-19	05	15.6%
20-25	08	25.0%
26-30	09	28.1%
31 AND ABOVE	10	31.3%
Marital Status		
Single	06	18.8%
Married	21	65.6%
Divorced	03	9.4%
Widowed	02	6.2%
Educational Level		
No formal education	07	21.8%
Primary	06	18.8%
Secondary	09	28.1%
Tertiary institution	10	31.3%
Occupation		
Farmers	13	40.6%
Business	07	21.9%
Civil servant	04	12.5%
Housewife	08	25.0%
Number of children		
01	08	25.0%
02	11	34.4%
03	04	12.5%
4 or more	09	28.1%

Legend: f= frequency, %= percentages

Health Facility-Related Factors Influencing Timely PCR Testing for HIV-Exposed Infants

Table 2 showed that 62.5%(20) of respondents had received reminders through SMS, phone calls, or home visits for their infant's PCR testing, while 37.5%(12) had not. Most respondents of 93.8% (30) reported that PCR testing services and supplies were consistently available, while only 6.2%(2) experienced shortages.

Table 2: showing how respondents receive reminders and the attitude of health workers

Variables	yes	%	No	%
Received reminders (SMS, calls, or home visits) for your infant's PCR test	20	62.5	12	37.5
PCR testing services and supplies are consistently available	30	93.8	02	6.2
Negative treatment or attitude from healthcare workers when seeking PCR testing	20	62.5	12	37.5

Legend: f= frequency, %= percentages

Figure 1: showing the distance to the health facility and information about the timing



Figure 1 showed that 43.8%(14) of the study population walk about 5-10 kilometres to the health facility, and only 21.8%(7) walk a distance less than 1 Kilometer. 65.6% (21) always get information about PCR from health workers, and only 6.3%(2) rarely get information on PCR testing at the facility.

Discussion

The study findings revealed that 43.8% of the respondents walk approximately 5–10 kilometres to the health facility for HIV-PCR testing, while only a few travel less than 1 kilometre. This may suggest that distance may influence the timeliness of testing; the farther individuals are from a facility, the more likely they are to delay testing.

The study also showed that 65.6% of respondents always received information about PCR testing from health workers, while a minority rarely received such information. This may suggest that health facilities play a central role in educating mothers about the importance and timing of HIV-PCR testing for infants.

The findings revealed that 62.5% of respondents had received reminders for their infant's PCR testing through SMS, phone calls, or home visits, while a lesser percentage had not. This may indicate that follow-up mechanisms play a significant role in promoting adherence to timely HIV-PCR testing schedules.

Results indicated that 93.8% of respondents reported that PCR testing services and supplies were consistently available, with a few stock-outs or shortages. This may indicate that the majority of health facilities were adequately equipped to provide testing services at the time of data collection.

Conclusion.

Availability of test kits, effective communication, and reminder systems promote uptake, though distance still limits access.

Study Limitations

The study involved only 32 participants from a single health facility (Apac General Hospital), which may limit

the generalizability of the findings to other settings within Uganda or beyond. Because data were collected at one point in time, the study could not establish cause-and-effect relationships between identified factors and timely PCR uptake.

Recommendations

Strengthen integration of PCR testing with routine maternal-child health services.

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List of acronyms & abbreviations

EID	Early Infant Diagnosis
HCT	HIV Counselling and Testing
HEI	HIV-Exposed Infant
HIV	Human Immunodeficiency Virus
PCR	Polymerase Chain Reaction
WHO	World Health Organisation

Source funding

The study was not funded.

Conflict of interest

The author did not declare any conflict of interest.

Data availability

Data is available upon request.

Author contribution

Babra Ayugii collected data and drafted the manuscript of the study
Lamex Ogwal supervised the study

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Author biography

Babra Ayugii, a student of a diploma in midwifery at Florence Nightingale School of Nursing and Midwifery
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