EAS Journal of Nursing and Midwifery
Abbreviated Key Title: EAS J Nurs Midwifery
ISSN: 2663-0966 (Print) & ISSN: 2663-6735 (Online)
Published By East African Scholars Publisher, Kenya

OPEN ACCESS

Volume-6 | Issue-4 | Sep-Oct -2024 | DOI: https://doi.org/10.36349/easjnm.2024.v06i04.001

Original Research Article

Prevalence and Associated Factors Affecting the Uptake of HIV Exposed Children Testing at 18 Months at Selected Clinics of Mansa District in Luapula Province of Zambia

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Article History
Received: 22.08.2024
Accepted: 30.09.2024
Published: 02.10.2024

Journal homepage:
https://www.easpublisher.com

Quick Response Code

Abstract: ***Introduction*****:** HIV remains a significant global public health challenge, with substantial impacts on individuals, communities, and healthcare systems. In 2018, it was estimated that approximately 37.9 million people were living with HIV, including 1.7 million children. The global prevalence of HIV among adults was approximately 0.8%, with a substantial proportion of individuals (around 21%) unaware of their HIV-positive status (UNAIDS, 2019). Since the onset of the HIV epidemic, an estimated 74.9 million people have become infected with HIV, resulting in approximately 32 million deaths from AIDS-related illnesses (UNAIDS, 2019). However, there has been significant progress in reducing AIDS-related deaths, with a notable decline of over 55% in AIDS-related deaths since the peak in 2004 and 2010 (UNAIDS, 2019). Thus, this study aimed at investigating the prevalence of HIV exposed children testing at 18 months and factors affecting the uptake of these services in various clinics of Mansa district, Luapula province, Zambia. The main objective of the study was to evaluate the prevalence of HIV exposed children testing at 18 months and factors associated with the uptake of these services in various clinics of Mansa district in Luapula province. ***Method*****:** An analytical cross-sectional research design was used for this study. The study population were HIV positive mothers who enrolled in PMTCT at the selected Clinics of Mansa District in Luapula Province. Simple random sampling method was used to select the respondents who were interviewed face to face using a pretested structured interview questionnaire. Data were analyzed using SPSS version 24. The t-test was used to assess statistical significance of associations between variables at significance level of 0.05 and 95% confidence. Furthermore, multiple logistic regression analysis was conducted to examine the relationship between the likelihood of HIV testing at 18 months (dependent variable) and various independent variables. ***Results*****:** The present study intended to assess timely infant HIV testing at 18 months and the factors influencing testing among infants born to HIV positive mothers in Luapula. The study found that 33% were tested at 18 months the factors that were significantly associated with infant testing were the mothers' age, time taken to reach health facility and belief that religion hinders infant HIV testing. ***Conclusion*****:** A large proportion of exposed infants did not undergo timely infant testing for HIV. The findings underscored that maternal living status are key indicators of a child's HIV risk. Maximizing the uptake of pediatric HIV testing for this vulnerable population will ensure optimal therapy and effective public health interventions to prevent transmission. When parents or guardians fail to test even high-risk children for HIV, urgent attention needs to be paid to identifying the caregivers' barriers to pediatric testing and overcoming these barriers. These findings suggest that many parameters contribute to MTCT of HIV-1. New strategies for further reduction of MTCT through family planning, pre/post-natal consultations and good clinical practices are needed.

Keywords: Prevalence, HIV Exposed Children, Testing, 18 Months, Factors, Uptake Services, Clinics, Mansa District, Luapula Province.

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INTRODUCTION

HIV remains a significant global public health challenge, with substantial impacts on individuals, communities, and healthcare systems. In 2018, it was estimated that approximately 37.9 million people were living with HIV, including 1.7 million children. The global prevalence of HIV among adults was approximately 0.8%, with a substantial proportion of individuals (around 21%) unaware of their HIV-positive status (UNAIDS, 2019). Since the onset of the HIV epidemic, an estimated 74.9 million people have become infected with HIV, resulting in approximately 32 million deaths from AIDS-related illnesses (UNAIDS, 2019). However, there has been significant progress in reducing AIDS-related deaths, with a notable decline of over 55% in AIDS related deaths since the peak in 2004 and 2010 (UNAIDS, 2019).

The burden of HIV is particularly pronounced in low and middle-income countries, with approximately 68% of people living with HIV residing in sub-Saharan Africa (UNAIDS, 2019). In this region, specifically in East and Southern Africa, where an estimated 20.6 million individuals live with HIV, there were 800,000 new HIV infections reported in 2018 (UNAIDS, 2019). HIV is caused by the human immunodeficiency virus, which progressively impairs the immune system's function, making the body susceptible to infections and certain cancers. In adults and adolescents, HIV is most commonly transmitted through sexual contact with an infected partner. In contrast, vertical transmission, where the virus is passed from mother to child during pregnancy, childbirth, or breastfeeding, is a significant mode of transmission in children under the age of 13, especially in the United States (CDC, 2020).

Globally, HIV infection in children is a pressing concern. In 2016, it was estimated that 2.1 million children were living with HIV, with over 90% of them residing in sub-Saharan Africa (UNAIDS, 2019). Mother-to-child transmission (MTCT) of HIV during pregnancy, childbirth, or breastfeeding accounted for approximately 160,000 new HIV infections in children worldwide in the same year (UNAIDS, 2019). Many infected infants and children succumb to HIV-related complications without being diagnosed. Without access to essential interventions such as early HIV diagnosis and treatment, a substantial percentage of HIV-infected infants in developing countries do not survive beyond their first year of life (UNICEF, 2020).

Early Infant Diagnosis (EID) of HIV, involving polymerase chain reaction (PCR) testing for HIV infection in infants under 18 months of age, provides a vital opportunity for timely intervention. The World Health Organization (WHO) recommends HIV DNA testing between 4 and 6 weeks of age for all infants born to HIV-positive mothers (WHO, 2016). EID allows for the identification of HIV-infected children, enabling early clinical evaluation, prophylaxis for opportunistic infections, and antiretroviral therapy (ART) to reduce morbidity and mortality (WHO, 2016).

Despite the presence of PMTCT services and EID programs, late diagnosis of pediatric HIV infections and continued vertical transmission remain significant challenges in many resource-limited settings. Access to virological testing for infants and antibody testing for older children is often limited, resulting in a bottleneck for pediatric treatment scale-up (UNICEF/WHO, 2018). Accessibility to EID services remains a concern, with only around 50% of HIV exposed infants accessing EID services within two months of age, significantly below the WHO-recommended 80% coverage (UNICEF/WHO, 2018).

In the context of Zambia, children have borne a heavy burden of the HIV epidemic. In 2017, there were approximately 72,000 children living with HIV, with 7,300 new pediatric infections reported that year. Despite a reduction in the number of new infections since 2010, challenges persist, particularly in the prevention of mother-to-child transmission (PMTCT) program (UNICEF/WHO, 2018). Although there is increasing coverage of the traditional 6-week infant test and more consideration is given to earlier time-points, the changing dynamics of transmission and increased drug exposure mean that increased efforts are needed to maintain follow-up throughout the entire exposure period. The aim is to ensure that all HIV-infected infants, including those infected in the postnatal period, are identified and receive treatment. The purpose of testing HIV exposed children is to detect HIV early and commence cART before complication arises. If HIV exposed children are not tested at 18 months it is likely that children who seroconverts was left unknown there by later on developing opportunistic infections and die before initiated on cART. Those who test at 18 months have the advantage of knowing their status known and intervention is provided before any complication arises (Mahomva *et al.,* 2020). Finally, it remains critical that infant retention be continued until the end of the exposure period. More effort should be given to establishing a final diagnosis at 18 months of age or 3 months after cessation of breastfeeding, whichever occurs later (women (UNICEF/WHO, 2018).

Studies conducted in some parts of Africa show a high maternal to child transmission of HIV at 18 months. For instance, a study conducted in Ethiopia in 2022 by Tiruneh showed a prevalence of 8.1% and the associated factors included mixed feeding practice, mother's lack of education, lack of antenatal care follow up and home delivery. Another study by Tsehay and Lam (2022) conducted in Bahir Dar administration in Ethiopia reviewed medical records of 754 infants and reported a transmission rate from mother to child of 5.8% .in this study the factors associated with maternal to child transmission of HIV were home delivery, infant not receiving ARV prophylaxis at birth, episiotomy and

mixed feeding practices. In Malawi, Ngambi *et al*., (2020) conducted a study on factors associated with the risk of HIV infection and HIV positivity among HIV exposed infants. The findings showed a prevalence of 7.2% where as a Nigerian study by Adelekan and his colleagues (2022) found a lower prevalence (2.1%). In Zambia HIV prevalence among children under 15 is estimated to be 0.7% (Spectrum 2022), however, limited information is available on the prevalence and associated factors of HIV exposed children testing at 18 months specifically in Mansa district. This study, therefore was aimed at assessing the prevalence and associated factors of HIV exposed children testing at 18 months in Mansa district.

Zambia is among the countries hardest-hit by the HIV/AIDS epidemic in Africa. It is estimated that 1.2 million of the total Zambian population of 10 million was infected with HIV by 2005. Although declining HIV trends have been observed in young people since 1998, HIV/AIDS in Zambia is still a major threat to the lives of adults of reproductive age and their children. While the national HIV prevalence has reduced by two percent from 16.3% to 14.3%, to the contrary Luapula Province HIV prevalence has increased (Zambia Demographic Health Survey (DHS) of 2022) Luapula has recorded a two (2) percent increase in the HIV/AIDS prevalence rate. Mansa is the provincial headquarters of Luapula province with an estimated population of 179,749, HIV prevalence is estimated at 10.2%, and with 18,361 people living with HIV/AIDS and 53.1% females are HIV positive (Zambia Demographic and Heath Survey, 2022). Nearly 35 per cent of babies born to HIV-infected parents inherit the disease, and without treatment about half of those will die before their second birthday. Often Parents do not even know until they see their children suffer and die. According to 2020 Zambia consolidated guidelines in ART, all HIV exposed children should be tested for HIV at 18 months before discharge from the Baby Mother follow up register to determine their status and offer relevant intervention based on results. Some of the measures put in place to ensure this is done include, training of HIV community health workers, individual counselling to exposed mothers, to mention but a few. Regardless of these interventions put in place, HIV-exposed children testing at 18months in selected clinics of Mansa district is still below 50%. The factors leading to the low number of HIV exposed children testing at 18 months remains unclear. It is for this reason that this research sought to investigate factors contributing to low number of HIV exposed children testing at 18 months at these facilities.

The study sought to investigate the prevalence and factors contributing to the uptake of testing at 18 months in various clinics of Mansa district. The study is a work up call for the government, society and other stakeholders to find workable means to end the vice in clinics which this study shall be undertaken and various clinics national wide. Additionally, it is aimed at identifying the gaps in the current health system and recommend ways to narrow them to achieve a future of productive citizens and also to promote early initiation of antiretroviral therapy which will in-turn promote drug adherence. The findings will help to address causes of low number of HIV exposed testing at 18 months so that measures are put in place and allow early diagnosis of HIV and thereby reducing cases of complicated HIV disease that can lead to death. Additionally, this study was conducted on both the mothers and health care providers.

METHODOLOGY

The study used an analytical cross-sectional research design and was conducted among HIV exposed children testing at 18 months at three selected health facilities in Mansa district, Luapula province. Stratified random sampling method was used to select the sample. Face to face interviews were conducted with others of HIV exposed infants using a pretested structured interviewer administered questionnaire was used to collect data from. The structured interview questionnaire was translated into the local language and consisted of five sections. Section A comprised demographic characteristics of the mother, section B elicited information on knowledge about HIV testing in children at 18 months. Section C elicited information on HIV testing, Section D elicited information on mothers' attitude toward HIV testing at 18 months and section E elicited information on stigma and discrimination and section F elicited information on access to healthcare services. Before conducting the study, ethical clearance was obtained from the University of Zambia, School of Medicine Research Ethics Committee and the National Health Research Authority.

After data collection the questionnaires were checked for completeness and consistency. Data was coded and entered for analysis in the Statistical Package for Social Sciences (SPSS) version 26.0 program for Windows (IBM Corp., 2019). The data was stratified and analyzed according to the sections of the data collection tool. Using SPSS and inferential statistical analyses was performed. The t-test was used to assess statistical significance of associations between variables. Statistical tests was performed at the significance level of 0.05 and 95% confidence. Results obtained was summarized as means, medians and modes and presented in the form of tables and charts. SPSS was used to make charts such as pie charts, bar charts and histograms of which a bell-shaped curve was an indication of normality. Furthermore, a multiple logistic regression analysis was conducted to examine the relationship between the likelihood of HIV testing at 18 months (dependent variable) and various independent variables. The independent variables included factors such as caregiver knowledge of HIV, attitudes towards HIV testing, access to healthcare services, and socio-economic status, while controlling for potential confounding factors. The regression analysis generated

odds ratios and p-values, indicated the strength and significance of the associations between the independent variables and the likelihood of HIV testing at 18 months.

RESULTS

Demographic Characteristics of Study Population

The study had a total of mother's who met the inclusion criteria. Most of the study participants 144(45.7%) were in the age category of 22-26 and 141(44.8%) in the age group above 27 years at enrolment. Overall, 315 (100%) identified Christians with respect to religion. The most of the mothers in the study 136 (43.2%) had a secondary level of education, 88 (27.9%) had a tertiary level while 80 (25.4%) and 11 (3.49%) had a primary level of education and no education respectively. Most of the mothers 194 (61.6%) were married while 71 (22.5%) were single and 37 (11.8%) were divorced (Table 4.1).

Table 4.4: Demographic Characteristics of the Study Participants

	Frequency	Percent (%)
Maternal Age		
17-21	30	9.52
22-26	144	45.7
Above 27	141	44.8
Maternal Education		
No Education	11	3.49
Primary	80	25.4
Secondary	136	43.2
University	88	27.9
Maternal Occupation		
Unemployed	171	54.3
Self-employed	82	26.0
Formal employed	62	19.7
Marital Status		
Married	194	61.6
Single	71	22.5
Divorced	37	11.8
Widower	13	4.13
Heard about MTCT		
Yes	232	73.7
No	83	26.4
Source of information		
Media (Radio, TV etc.)	86	27.3
Health Facility	118	37.5
Relatives	56	17.8
Friends	37	11.8
Church	18	5.71
Religion		
Christian	315	100

Proportion of Infants Tested at 18 Months

The majority of the babies were tested at 246 (77%) at 6 weeks, 23 (7%) at 6 months, 31 (10%) at 12 months and approximately 13 (4%) were tested at 18 months (Figure 4.1).

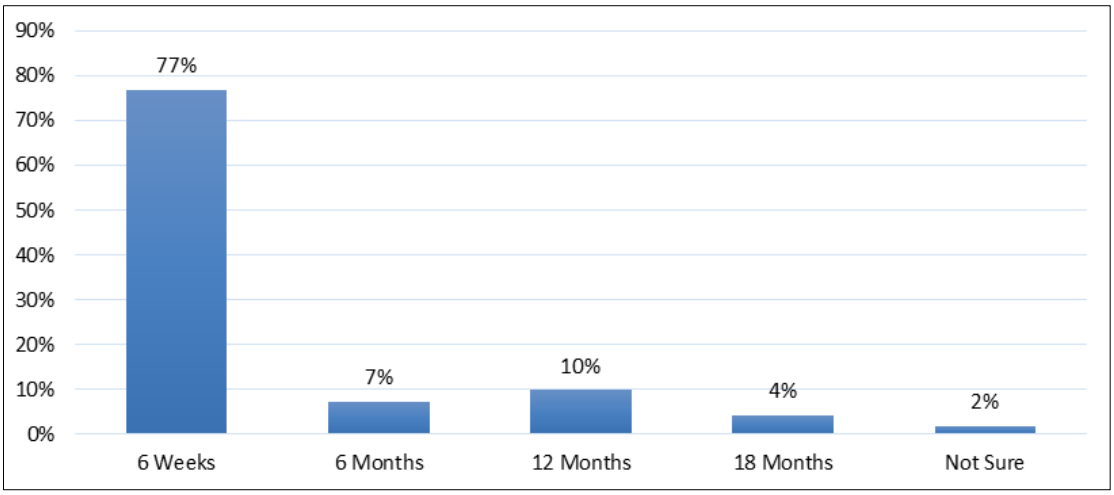

Figure 4.5: Age Infant Tested for HIV for the First Time.

The results show that the majority 212 (67%) of the babies were not tested for HIV at 18 months and 103 (33%) were tested for HIV at 18 months (Figure 4.2).

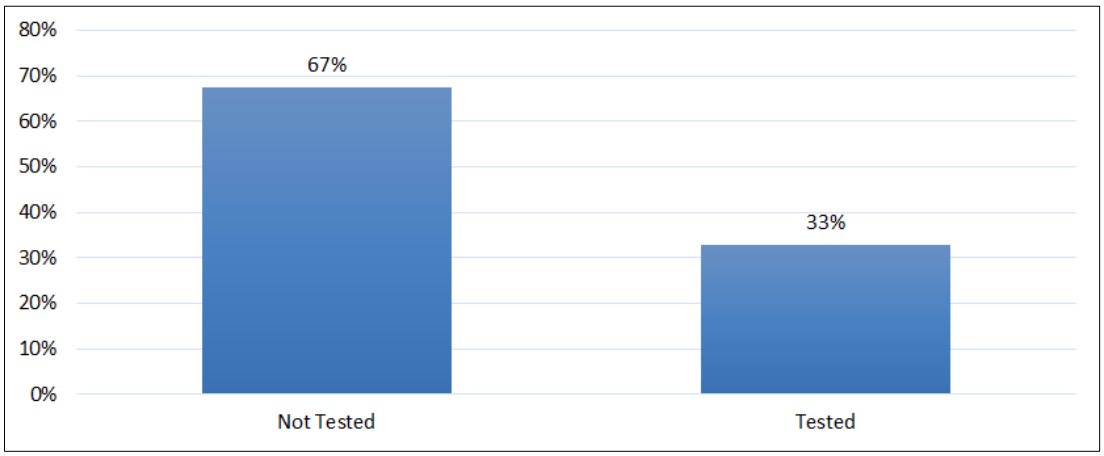

Figure 4.5.1: Proportion of infants tested for HIV at 18 months.

Awareness of MTCT and Sources of Information

Regarding awareness of what MTCT is, the study found that 232 (73.7%) were aware about MTCT while 83 (26.3%) where not aware about MTCT (Figure 4.3).

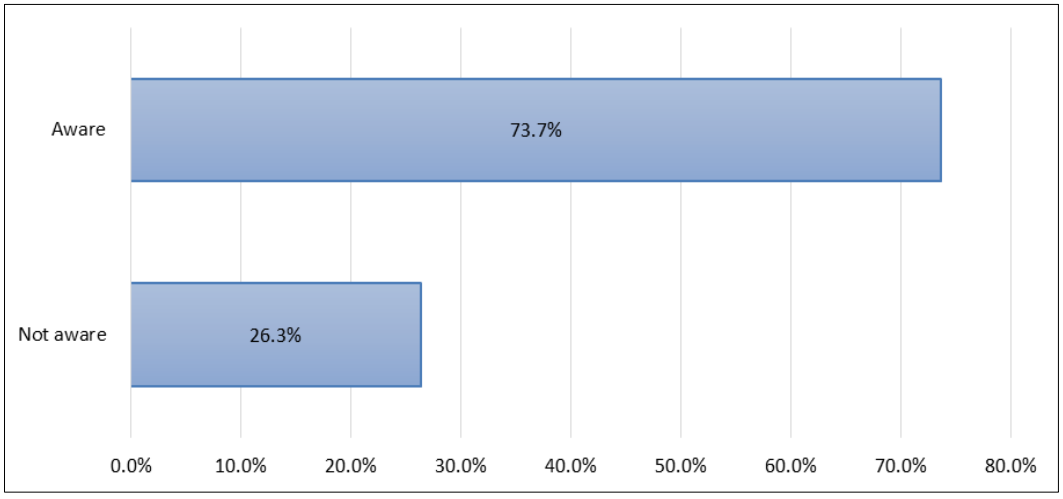

Figure 4.6: Participants awareness about MTCT

Participants' responses regarding sources of HIV information interestingly showed health workers 118 (37.5%) and relatives or friends 93 (29.5%) were the most common sources of information. This was followed by mass media 86 (27.3%) and churches 18 (5.7%) (Figure 4.5).

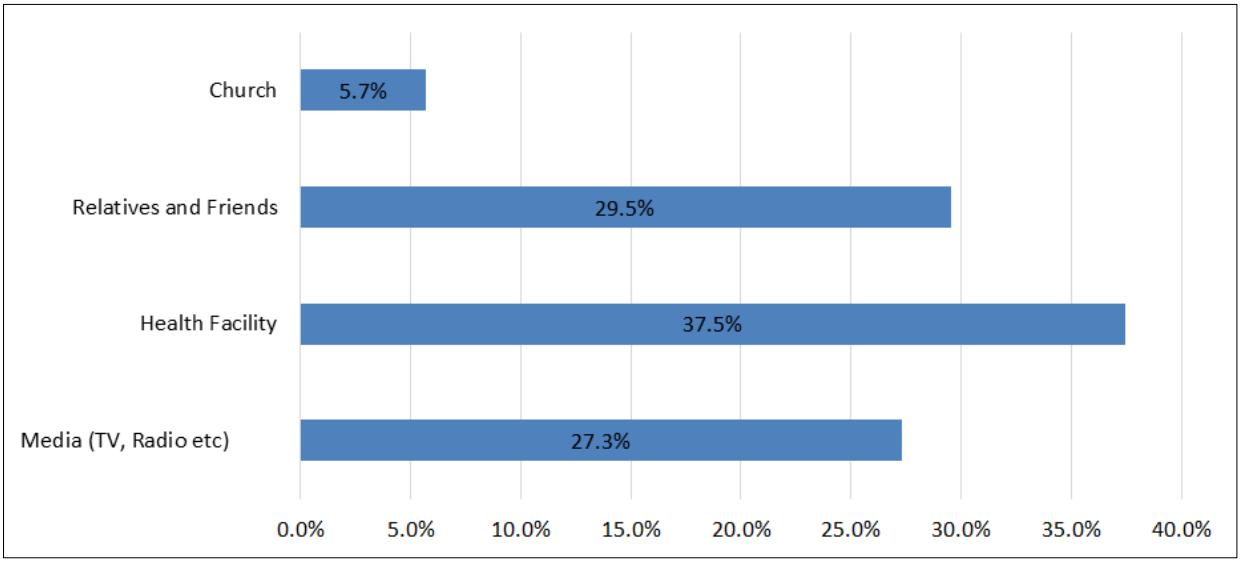

Figure 4.6.1: Sources of Information on MTCT and HIV testing

Challenges to Assessing Health Services

The study found that the majority of the mothers in the study did not receive any encouragement or support from their families and the community members 227 (72.1%) and only 88 (27.9%) received support (Figure 4.6)

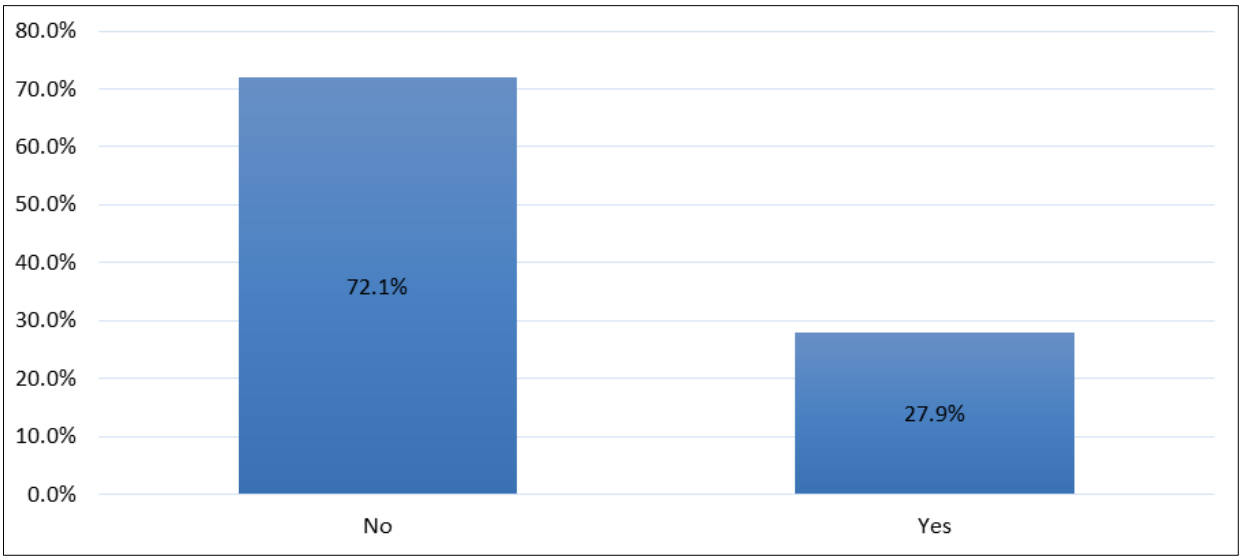

Figure 4.7: Availability of Family and Community Support to HIV positive Mothers

The turnaround time for DBS results was assessed, most of the mothers received HIV results for their children between 3-4 weeks 180 (57.1%), 78 (24.8%) over one month and approximately 57 (18.1%) received results within 1-2 weeks of testing (Figure 4.7).

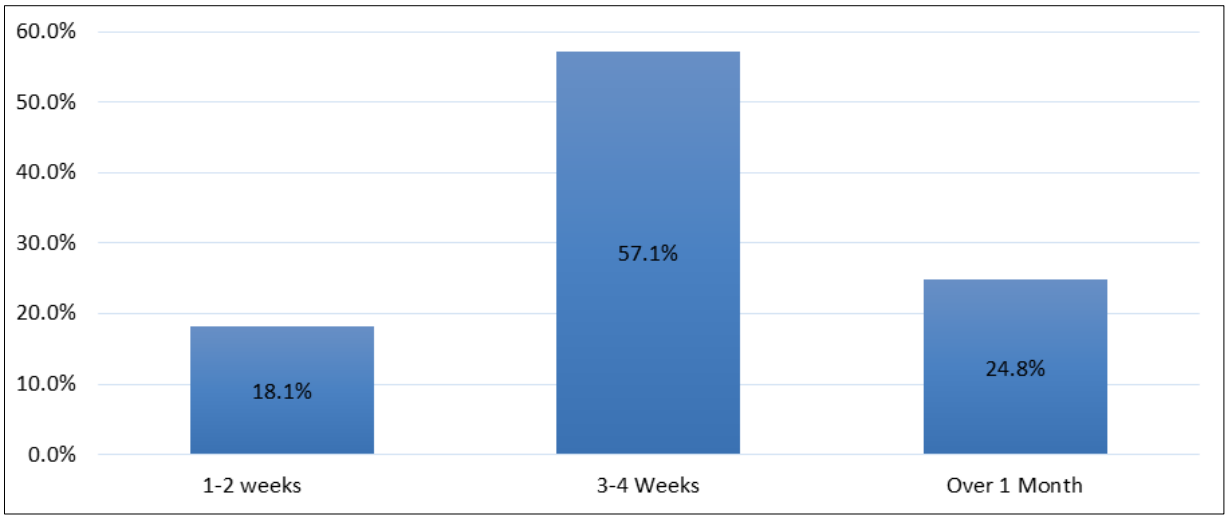

Figure 4.8: Infant HIV Result Turnaround Time

The other common problem experienced by the mothers was the distance or the time taken to reach the health facility. The current study found that most of the mothers 141 (45%) travelled less than 30 minutes to reach the health facility while 129 (41%) and 45 (14%) took approximately 30-60 minutes and above 1-3 hours to reach the health facility respectively.

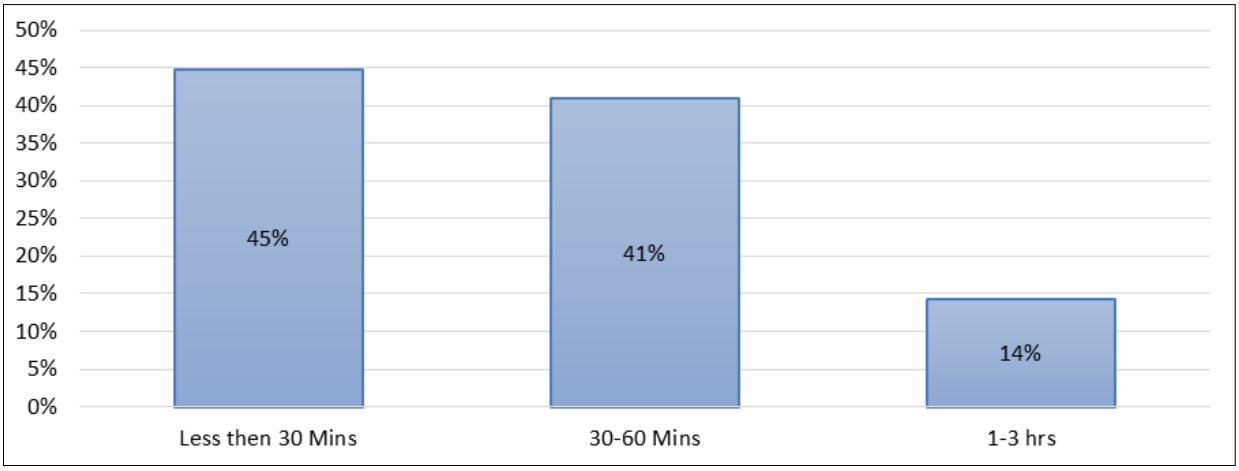

Figure 4.8.1: Time taken to reach the Health Facility

4.9 Factors Associated with HIV Testing At the 18th Month

In the univariate (unadjusted) logistic regression analysis, factors found to be significantly associated with infant testing at 18 months were age-group, occupation, distance to facility, time taken to reach facility, awareness of importance of MTCT. Mothers aged above 27 years were 3.83 times more likely to have their children tested for HIV at 18 months compared to mothers aged 17-21 years (OR: 3.83; 95% CI: 1.48,9.95). Mothers who were employed were 2.17 times more likely to have their children tested for HIV at 18 months unlike mother's who were not employed (OR: 2.17; 95% CI: 1.19,3.97). Furthermore, the result showed that mothers who stayed 5-10 kilometers away from the health facility were 0.40 times less likely to take their children for HIV testing than mothers who stayed close to the health facility (OR:0.40; 95% CI: 0.19,0.84). Mothers who knew what MTCT was were 2.51 times more likely to have their children tested for HIV than mothers who were not aware about MTCT (OR: 2.51; 95% CI: 1.37, 4.61) (Table 4.2).

Table 4.2: Factors associated with HIV testing at 18 months

	Unadjusted Model				Adjusted Model			
	OR	P-Value	95% CI		OR	P-Value	95% CI	
Maternal Age-group								
17-21	Ref							
22-26	0.97	0.94	0.36	2.59	0.67	0.48	0.22	2.03
Above 27	3.83	0.01	1.48	9.95	3.87	0.01	1.33	11.3

Maternal Education Level								
No Education	Ref							
Primary	0.52	0.37	0.12	2.21	0.22	0.08	0.04	1.17
Secondary	1.45	0.59	0.37	5.74	0.63	0.57	0.13	3.08
Tertiary	2.12	0.29	0.53	8.54	0.85	0.85	0.17	4.26
Maternal Occupation								
Unemployed	Ref							
Self-Employed	1.37	0.28	0.78	2.41	0.96	0.91	0.47	1.94
Employed	2.17	0.01	1.19	3.97	1.77	0.13	0.84	3.74
Maternal Marital Status								
Single	Ref							
Married	0.92	0.78	0.52	1.64	0.58	0.14	0.28	1.20
Divorced	1.34	0.49	0.59	3.03	0.69	0.47	0.26	1.86
Widower	0.36	0.20	0.07	1.74	0.30	0.19	0.05	1.82
Source of Information								
Media (TV, Radio etc.)	Ref							
Health Facility	1.11	0.72	0.62	1.98	1.35	0.42	0.65	2.80
Relatives and Friends	0.69	0.25	0.36	1.30	0.92	0.84	0.40	2.12
Church	0.53	0.30	0.16	1.76	1.03	0.97	0.24	4.50
Distance to Health Facility								
Less than 1 Km	Ref							
1-5km	0.77	0.33	0.45	1.31	0.93	0.82	0.49	1.77
5-10km	0.40	0.02	0.19	0.84	0.66	0.39	0.25	1.71
More than 10km	1.00	0.99	0.38	2.58	1.37	0.58	0.44	4.23
Time to reach health facility								
Less than 30 Mins	Ref							
30-60 Mins	0.80	0.39	0.49	1.32	0.63	0.15	0.34	1.19
More than 60 Mins	0.36	0.02	0.16	0.83	0.27	0.02	0.09	0.79
Mother Aware of MTCT								
No	Ref							
Yes	2.51	0.003	1.37	4.61	1.91	0.12	0.85	4.33
Region Hinders infant HIV testing								
Disagree	Ref							
Agree	1.55	0.08	0.95	2.52	2.22	0.02	1.13	4.35
HIV testing at 6 weeks								
No	Ref							
Yes	1.06	0.82	0.62	1.82	1.38	0.33	0.72	2.67
Reception by Health Staff								
Fair	Ref							
Good	3.48	0.25	0.42	28.69	2.33	0.46	0.24	22.3
Support from family and community								
No	Ref							
Yes	1.26	0.39	0.75	2.11	1.11	0.75	0.60	2.05
Counselling Done								
No	Ref							
Yes	2.97	0.32	0.35	25.0	2.86	0.39	0.26	31.9

In the multivariable logistic regression analysis, factors found to be significantly associated with HIV testing at 18 months were age-group, time taken to reach health facility and the belief that religion hinders HIV testing. Regarding age-group, the study found that mothers aged above 27 years were 3.87 times more likely to take their children for HIV testing than mothers aged 17-21 when adjusted for other factors in the study such as maternal education, occupation, time taken to reach health facility and awareness of MTCT (AOR: 3.87; 95% CI: 1.33,11.3). Furthermore, the study found that mothers who belied that religion hinders HIV testing were more like to take their children for HIV testing than mothers who did not believe that religion can hinder HIV testing (AOR: 2.22; 95% CI: 1.13,4.35). Mothers who travelled for more than 1 hour to reach the health facility were less likely to take their children for HIV testing compared to mothers who took less than 30 minutes to reach the health facility (AOR: 0.27; 95% CI: 0.09,0.79) (Table 4.2).

DISCUSSION

The current study found that mothers aged 27 and above were more likely to take their children for HIV testing at 18 months. This finding is consistent with a study conducted in Kumi, Ethiopia which found that individuals in the age group 25–34 years were more likely to access HIV care services compared to those in the age group 18–24 years (Lubogo *et al*., 2021). Another previous study from Cameroon found that younger mothers tend to have more HIV-infected children than older ones because younger mothers may lack experience to care for themselves as well as their baby; also their socio-economic status seems less favorable compared with that of older women (Nkenfou *et al*., 2019). Literature on access to HIV care services disaggregated by age group is limited. However, a plausible explanation for this finding may be that individuals in this age group (25–34 years) are more familiar with the health care system compared with those in the age group (18–24 years) and so are able to navigate through the care system better.

The current study found that that the uptake of timely HIV testing at 18 months was low (33%). This finding is consistent with a previous study conducted in South Africa which found that uptake of HIV infant testing was low with only 39% and 24% of infants testing respectively at 9 months and 18 months (Nelson *et al*., 2022). However a study conducted in Ethiopia found that the prevalence of timely infant HIV testing was 62% (Ebuy *et al*., 2020). The possible reason the differences in findings could be due to the high geographical mobility of the mothers in our context (mother tend to charge facilities to receive care from often). Furthermore, although the test might have been done, the result might not have been accessible. From a health system perspective, accessing 18 months' test results is much more time consuming and challenging than for PCR results, as it relies on physically finding folders or registers where the tests are documented versus accessing an electronic database (Nelson *et al*., 2022).

The current study further found that on average most of the HIV results were received approximately after a month. This finding is consistent with other studies that have shown that delayed return of infant HIV results to the facility and maternal notification of results is a major challenge of PMTCT in Nigeria and many SSA countries (Okusanya *et al*., 2023). Delay in dispatch of results may be due to several reasons, including poor sample collection, batching of samples to be sent to the reference laboratory, malfunctioning PCR machines, and workload of staff operating the machine in the reference laboratory (Okusanya *et al*., 2023). Linkage between early infant diagnosis and the HIV care cascade needs to improve further to enable this reduction in mortality and, crucially, to increase the proportion of children diagnosed as HIV positive who initiate ART (Sirirungsi *et al.*, 2016). This finding highlight the need to address potential institutional barriers, such as timely communication of positive results to parents or caregivers and coordinated transfers to ART clinics (Sirirungsi *et al*., 2016).

Findings of this study corroborates with results of a study conducted by Osei (2021) in Ghana which reported that HIV positive mothers were satisfactorily knowledgeable on issues related to HIV testing at this age. They provided suitable responses to questions on specific tests conducted on exposed infants and the exact times these tests were performed. This finding is however at variance with findings of Adeniyi *et al*., (2019) and Bwana *et al*., (2019) which pointed out that knowledge about early infant diagnosis was unsatisfactory among mothers as some were oblivious of the appropriate time for testing infants. Hassan *et al*., (2020) attributed inadequacy in knowledge of mothers to failure of health workers to provide mothers with sufficient information on EID during ANC and PMTCT trainings. The finding is in disagreement with results of this study as mothers interviewed stated that information on HIV testing of their children was made available to them during PMCT training sessions. Knowledge of mothers is impressive in this study and shows efforts put in place by health workers to provide mothers with information on HIV services. This is a step in the right direction as maternal awareness of EID services increases the chances of uptake of such services (Musekura, 2021).

The study found that about 90% of women had a positive attitude towards HIV testing of their children, however, this contradicts the findings of the study by Solomon *et al*., (2022), which revealed that 66.7% of pregnant women had good knowledge but half of them (50%) had poor practice and around one-third of the pregnant women (29%) had negative attitudes towards the prevention of mother-to-child transmission of HIV/AIDS. However, the results of this study are in also in the same accord with the study that was conducted by Mathew *et al*., (2022), which revealed that most HIV positive women who commit to antenatal care have a positive attitude towards the uptake of HIV services as they are aware of the importance of such services.

Regarding religious beliefs, the current study found that individuals who believed that religion hinders timely infant HIV testing were more likely to take their children for testing than those who did not. This finding is consistent with a study conducted in Zimbabwe which found that some women feel that spiritual healing of HIV is a better alternative to medical management (Tafuma *et al*., 2018). A previous study conducted in Uganda found that approximately 1.2% of the population in their study discontinued their ART because they believed that their pastors' prayers had cured them of HIV (Wanyama *et al*., 2007). The possible reasons for these findings could that in Africa and in countries like Zambia, religious organizations are influential social networks that have the power to support or stigmatize people living with

HIV and endorse or reject medical treatment of HIV. HIV programs need to strengthen collaboration with religious institutions so that appropriate messages are shared with the population and people leaving with HIV.

This current study found that mothers who had support from family and community members were more likely to take their children for HIV testing at 18 months than those that did not receive any support but this observation was not statistically significant. This finding is consistent with a previous study in Uganda which revealed that individuals with a supportive family had better access to HIV care services than those without (Lubogo *et al*., 2015; Mkandawire, 2017). Given our findings, we believe that community leaders and the district health team have a role to play in promoting family support for HIV positive clients. The opportunities for stakeholders to foster family support for HIV positive clients may be through holding village meetings, workshops and local radio talk shows. Another useful avenue may be through the use of family-oriented organizations such as churches, mosques and non-governmental organizations (NGO's). The study also found that mothers who were counselled were more likely to take the child for HIV testing unlike mothers who were not counselled. This finding is consistent with a previous study which found that counselling is an important factor associated with timely infant testing (Ebuy *et al.*, 2020). This could be attributed to the reason that when mothers were counselled on feeding options, at the same time, they were also being counselled on other PMTCT cascades, such as advantages of timely infant testing.

The current study also found that mothers who spent long hours to reach the health facility were less likely to take their children for HIV testing. This is in line with other studies that have reported that long distance to the health facilities is a major contributing factor to poor attendance and poor outcomes (Flax *et al*., 2017; Mpinganjira *et al*., 2020; Tenthani *et al*., 2014). These findings suggest the need to develop and strengthen the health-related funding mechanisms that will improve social networks and support structures in the community. This calls for implementation and intensification of differentiated service delivery models. These include community ART groups, fixed community mobile ART clinics, home delivery of ART and multi-month ART prescription among others which can be implemented to compliment the current approach of facility-based model. These interventions are less costly to the clients and reduce number of clinic visits which is favorable to the patients (Mpinganjira *et al*., 2020).

CONCLUSION

In conclusion, a large proportion of exposed infants did not undergo timely infant testing for HIV. The findings underscored that maternal living status are key indicators of a child's HIV risk. Maximizing the uptake of pediatric HIV testing for this vulnerable population will ensure optimal therapy and effective public health interventions to prevent transmission. When parents or guardians fail to test even high-risk children for HIV, urgent attention needs to be paid to identifying the caregivers' barriers to pediatric testing and overcoming these barriers. These findings suggest that many parameters contribute to MTCT of HIV-1. New strategies for further reduction of MTCT through family planning, pre/post-natal consultations and good clinical practices are needed.

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Cite This Article: Sandwe Katongo, Catherine M Ngoma, Kabwe C. Mutambo (2024). Prevalence and Associated Factors Affecting the Uptake of HIV Exposed Children Testing at 18 Months at Selected Clinics of Mansa District in Luapula Province of Zambia. *EAS J Nurs Midwifery, 6*(4), 87-97.