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Uptake of early infant HIV diagnosis and its associated factors in Tanzania: an analytical cross-sectional study

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Abstract

The uptake of early infant HIV diagnosis services is crucial for preventing mother to child transmission of virus, and timely management. However, the uptake of the services remains a global challenge, despite major advances in HIV testing. This study investigated the uptake of early infant HIV diagnosis and its associated factors among mothersof exposed infants. The results showed that the uptake of early infant HIV diagnosis was 76%. Factors associated with the uptake are caregivers being married, have higher income level and having adequate knowledge on early infant HIV diagnosis.

Keywords Early infant HIV diagnosis, Mother to child transmission, Anderson model, Tanzania

Background

Human Immunodeficiency Virus (HIV) is a global public health concern that threatens the lives of children. To reach the 2030 goal of eliminating HIV, the implementation of Early Infant Diagnosis (EID) and treatment among infants who have been exposed to the virus as early as in the first 4–6 weeks of life was recommended by World Health Organization (WHO) [12].

In Tanzania, the uptake of EID services among HIV-exposed children at 6 weeks and below has received less attention despite the possibility of contracting HIV during pregnancy [5]. Evidence shows that early infant diagnosis coverage for HIV-exposed children has consistently decreased from 79.0% in 2015 to 58.1% in 2019 and 62.5% in 2020 [14].

The PEPFAR report of 2020 showed that, despite 92% of pregnant women being enrolled in PMTCT programs, the retention rates were 67% for pregnant women and 83% for breastfeeding mothers, and this has contributed to the mother to child HIV infection rate of 11% in 2019. This indicates that approximately one in ten women may not return to clinic for continuation of HIV care including the early infant HIV diagnosis services. Several factors have been reported to contribute to the lower uptake of EID services, and these include those related to the healthcare system like a lack of trained staff, and a lack of vehicles to transport the samples to the reference laboratory for analysis [3]. But the low coverage could also be attributed to individual-related factors like inadequate knowledge, negative attitude regarding EID, un-satisfaction due to lengthy wait for results, lack of significant other's support and failure to disclose the HIV status.

The Andersen behavioral model for healthcare service utilization [2], suggests that, the healthcare service

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utilization is influenced by predisposing factors (pre-existing factors like socio-cultural-economic characteristics), enabling factors (factors that facilitate a use of services, e.g. knowledge), and need factors (factors that necessitate the use of services, e.g. infant being exposed to HIV). Therefore, this study aimed to determine the uptake of early infant HIV diagnosis and its associated individual-related factors as suggested by the Andersen model among mothers with HIV-exposed infants in Dodoma region, Tanzania.

Methods

Study design and setting

This was an analytical cross-sectional study conducted in the Dodoma region of Tanzania, in July 2023. Dodoma is characterized by a rapid population growth, making it susceptible to the rapid spread of infectious diseases, including HIV. The agriculture industry and livestock keeping dominate the economy of this region. The region has an HIV prevalence rate of 5%, which is comparatively higher than the national average of 4.7% [15]. This study was conducted in higher-levels healthcare facilities including two tertiary-level hospitals (zonal and regional), and four secondary levels (district hospitals), this is due to high number of enrollments in PMTCT services (Prevention of Mother to Child Transmission).

Study population, sample size and sampling

This study involved mothers of HIV-exposed infants of age 6–12 months. The Yamane formula was used to determine the sample size for a finite population and the sample size obtained for this study is 147 participants who were conveniently selected within the facility.

Data collection methods and tools

A self-administered questionnaire using a pre-tested structured tool with closed-ended questions adapted and modified from Ankrah and Dako-Gyeke [3] was used to collect the background information of the exposed infant's mothers. Knowledge and attitude were assessed using 10 questions each, and measured in binary and Likert scale respectively, and scores were assigned for each response. Data on the uptake of EID services were collected by reviewing the PMTCT cohort register and an HIV Exposed Infant (HEI) card, which were requested from the in-charge of PMTCT unit.

Variables

The dependent variable is the uptake of EID which was measured in binary scale (yes/no) on whether an HIV-exposed infant was tested for HIV within six weeks of age. The independent variables were the predisposing factors which are the demographic characteristics (age, marital status, educational level, occupation status, and income level). Enabling factors (knowledge, attitude, disclosure of HIV status, significant other's support and satisfaction with turnaround time).

Data analysis

Descriptive statistics, a chi-square test and a logistic regression model was used to establish the association between study variables. Odds ratio and a 95% confidence interval were reported and the p-value of <0.05 was considered statistically significant.

Results

Background characteristics of infants' mothers

The mean age of participants was 31 years (SD = 6.5). About half of participants, 82 (55.9%) were married, 69 (46.1%) had primary education, and 56 (38.1%) were farmers. Majority, 141 (95.9%) had disclosed their HIV status to their relatives, while only 61 (45.2%) had significant others support on EID uptake, and 97 (66.0%) were satisfied with turnaround time.

The slight majority, 99 (67.3%) had adequate knowledge on EID, and 86 (58.5%) had positive attitude towards EID (Table 1). Moreover, results showed that the almost all healthcare facilities assessed have trained personnel on EID services (100%), valid DBS kits (100%), while only 43.5% have guidelines for PMTCT.

Uptake of early infant HIV diagnosis

About 111/147 infants have tested for HIV within six weeks of age, equivalent to 76%. The chi-square test results showed that the uptake of EID is significantly related with marital status, education level, area of residence, number of children since HIV diagnosis and knowledge on EID ($p<0.05$). Other predisposing and enabling factors did not show any relationship with the uptake of EID (Table 1).

Factors associated with the uptake of early infant HIV diagnosis

The sole effect of each variable on the uptake of EID was determined using a multivariate logistic regression model by controlling all other variables that were significant in the bivariate model (Table 2). Results showed that, mothers who were married were four times more likely to take the EID services compared to unmarried ones (AOR = 4.26, 95% CI 1.2–14.0; p = 0.01). Mothers with income between 100,000 and 300,000 Tsh were three times more likely to take the EID services (AOR = 3.64, 95% CI 1.110–11.998; p = 0.03) compared to mothers with income less than 100,000 Tsh. Moreover, the odds of taking the EID is 1.6 times higher among mothers with adequate knowledge (AOR = 1.62, 95% CI 1.08–16.18;

Table 1 A bivariate comparison of cases that did and did not uptake EID (N = 147)

Variable	Total n (%)	Not uptake n (%)	Uptake n (%)	P-value
Age (years)				0.76
≤ 30	M = 31 ± 6.3	M = 30.8 ± 6.2	31.2 ± 6.6	
Education level				0.007
Primary	69 (46.9)	25 (36.2)	44 (63.8)	
Secondary education	63 (42.9)	9 (14.3)	54 (85.7)	
Tertiary	15 (10.2)	2 (13.3)	13 (86.7)	
Religion				0.05
Christian	86 (58.5)	26 (30.2)	60 (69.8)	
Muslim	61 (41.5)	10 (16.4)	51 (83.6)	
Marital status				< 0.001
Married	82 (55.8)	9 (11.0)	73 (89.0)	
Unmarried	18 (12.2)	27 (41.5)	38 (58.4)	
Place of residence				0.02
Rural	23 (15.7)	10 (43.5)	13 (56.5)	
Urban	124 (84.4)	26 (21.0)	98 (79.0)	
Mothers' occupation				0.47
Housewife	26 (17.6)	5 (19.2)	21 (80.8)	
Employed	17 (11.5)	6 (35.3)	11 (64.7)	
Other activities	104 (70.7)	25 (24.0)	79 (76.0)	
Income				< 0.001
Less than 100,000	45 (30.6)	22 (48.9)	23 (51.1)	
100,000–300000	82 (55.7)	12 (14.6)	70 (85.4)	
350,000+	20 (13.6)	2 (10.0)	18 (90.0)	
Number of children				0.28
One	33 (22.4)	6 (18.1)	27 (81.8)	
Two	39 (26.5)	13 (33.3)	26 (66.7)	
More than two	75 (51.0)	17 (22.7)	58 (77.3)	
Number of children since HIV diagnosis				0.01
One	108 (73.4)	32 (29.6)	76 (70.4)	
More than one	39 (26.5)	4 (10.3)	35 (89.7)	
Transport used				0.79
Public motor vehicle transport	32 (21.8)	9 (28.1)	23 (71.9)	
Bicycle	20 (13.6)	4 (20.0)	16 (80.0)	
By foot	95 (64.6)	23 (24.2)	72 (75.8)	
Time taken from home to health facility in minutes				0.40
10–20	73 (49.7)	18 (24.66)	55 (75.34)	
21–30	39 (26.5)	7 (17.95)	32 (82.09)	
More than 30	35 (23.8)	11 (31.43)	24 (68.57)	
Comorbid condition				0.08
No	144 (97.9)	34 (23.61)	110 (76.4)	
Yes	3 (2.1)	2 (66.7)	1 (33.3)	
Satisfied with the turnaround time				0.36
Satisfied	83 (56.4)	18 (21.7)	65 (78.3)	
Unsatisfied	64 (43.6)	18 (28.1)	46 (71.9)	
Knowledge				< 0.001
Inadequate	48 (32.6)	26 (54.2)	22 (45.8)	
Adequate	89 (67.3)	10 (10.1)	89 (89.9)	
Attitude				0.98
Negative attitude	61 (41.4)	15 (24.6)	45 (75.4)	

Table 1 (continued)

Variable	Total n (%)	Not uptake n (%)	Uptake n (%)	P-value
Positive attitude	86 (58.5)	21 (24.4)	65 (75.6)	

Table 2 Logistic regression results for the factors associated with uptake of EID

Variable	EID uptake			
	Unadjusted odds ratio		Adjusted odds ratio	
	OR [95% CI]	P-value	AOR [95% CI]	P-value
Residence				
Rural	Ref		Ref	
Urban	2.89 [1.14–7.35]	0.02	3.61 [0.86–15.15]	0.07
Education level				
Primary	Ref		Ref	
Secondary	3.40 [1.44–8.05]	0.005	1.51 [0.48–4.66]	0.47
Tertiary	3.69 [0.77–17.70]	0.10	1.73 [0.25–12.10]	0.57
Marital status				
Married	5.7 [2.46–13.48]	< 0.0001	4.26 [1.29–14.0]	0.01
Unmarried	Ref		Ref	
Number of children since HIV diagnosis				
One	Ref		Ref	
More than one	3.68 [1.2–11.21]	0.02	1.37 [0.30–6.15]	0.67
Income				
Less than 100,000	Ref		Ref	
100,000–300,000	5.58 [2.39–13.0]	< 0.001	3.64 [1.11–11.99]	0.03
350,000+	8.60 [1.78–41.50]	< 0.001	8.21 [0.82–81.35]	0.07
Satisfied with the turnaround time				
Satisfied	6.46 [0.56–73.53]	0.13	2.51 [0.8–7.81]	0.11
Unsatisfied	Ref		Ref	
Knowledge				
Inadequate	Ref		Ref	
Adequate	10.51 [4.42–25.0]	< 0.0001	4.19 [1.08–16.18]	0.0374

p = 0.03) compared to those with inadequate knowledge (Table 2).

Discussion

This study examined the uptake of EID and its associated individual factors among mothers of HIV-exposed infants. In this study, majority (76%) of HIV exposed infants were tested within six weeks of age. This finding is unexpectedly higher compared to the national coverage in 2020 which was 62.5% [14]. This increase is due to the efforts made by the government to improve the availability of services by training healthcare workers on PMTCT including availability of DBS kits. This is encouraging because it demonstrates a proactive approach towards addressing this crucial healthcare need. Our findings are comparable with the findings of studies conducted in Mozambique in 2018 (73.5%) [8], and Zambia in 2014 (73%) [9]. However, the finding of this study is higher than the findings of the study in West Shoa Zone, Ethiopia in 20,218 (58.5%) [7], and a report from India in 2020 (51%) []. The reasons for the differences may be due to the differences in the healthcare system-related factors or differences in the sociodemographic characteristics of the mothers.

Our findings indicate that, among the enabling factors, only knowledge found to have a significant effect on the EID uptake. Mothers with adequate knowledge of EID tending to test their infants early than those with inadequate knowledge. Similar findings have been reported in previous studies conducted in North Zone Tanzania [4] and Zambia [9]. This implies that awareness and education programs could play a vital role in promoting EID which may lead to early detection and management for HIV-exposed infants. Failure to show association among other enabling factors as suggested by Anderson could be explained by the limitation of data collection tools, or potential mediating effects between the factors. More studies in this area are needed to confirm the role of other enabling factors to the uptake of EID.

On the other hand, among the predisposing factors, married mothers were inclined to have had their infants tested early compared to unmarried mothers. This finding is consistent with the findings in North Zone Tanzania [4, 6].

Mothers with higher income levels inclined to uptake the EID services more as compared to those with low income levels. This suggests the influence that socioeconomic characteristics have on healthcare behaviour. This was also reported in a study conducted in rural Kenya [10], Nigeria [1] and in Uganda [13]. This may be explained by the reasons that mothers with high income can afford the transport costs to the treatment centre. Therefore, efforts should be placed on improving access of the service to lower-income individuals.

Conclusion

Majority of mothers had their HIV-exposed infants undergo early HIV diagnosis within the recommended time frame; enabling factors like adequate knowledge, and individual factors like being married and higher income level influence mothers to have their infants undergo the EID services. Therefore, emphasis should be placed on education campaign and community outreach programs to ensure equitable access of the EID services.

Abbreviations

AIDS	Acquired Immunodeficiency Syndrome
ART	Anti-Retroviral Therapy
DBS	Dried Blood Spots
EID	Early Infant Diagnosis
HEI	HIV Exposed Infant
HIV	Human Immunodeficiency Virus
PEPFAR	President Emergency Plan for AIDS Relief
PMTCT	Prevention of Mother-to-Child Transmission

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Author contributions

E.G.K conceptualized the research idea, collected data, carried out statistical analysis, interpreted the findings, and wrote the original draft of the manuscript. S.A.S contributed to the conceptualization of the research idea, supervision, review, and editing of the manuscript. W.C.M contributed to the conceptualization of the research idea, supervision, review, and editing of the manuscript.

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Availability of data and materials

All the necessary data analysed and supporting the findings of this study are included in this manuscript. In addition, the SPSS dataset used for the current study is available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

The study was approved by the University of Dodoma research committee on May 24th, 2023, with Ref. No. MA.84/261/61/3, and permission for research conduct was sought from the Regional Administrative Secretary (RAS) for the Dodoma region on May 31, 2023, with Ref. No. DA.122/467/01H/153. Permission for research conduct at the district level was sought from the District Executive Director (DED) of Chamwino, Kondoa, Kongwa, Mpwapwa, and Dodoma Regional Referral Hospital with Ref. No. CDC/E.10/8/01/80, KTC/D.50/13/Vol111/57, HW/KOG/T.10/8/84, HW/MPW/S10/6/34, AND PB.22/1307/02 respectively. All participants were informed about the study objectives, confidentiality of their information was assured, and voluntary participation was observed.

Consent for publications

Not applicable.

Competing interests

The authors declare no competing interests.

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