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Assessment of knowledge and practice of prevention of mother-to-child-transmission of HIV interventions and their correlates among HIV-infected nursing mothers in a tertiary hospital, Southeast, Nigeria

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Abstract

Introduction: *an adequate knowledge of mother-to-child transmission (MTCT) of Human Immunodeficiency virus (HIV) and its prevention interventions with appropriate practice among HIV-infected women of childbearing age may reduce the spread of the virus to children. This study aimed to determine the knowledge and practice of prevention of mother-to-child transmission (PMTCT) interventions and their correlates among HIV-infected nursing mothers.* ***Methods:*** *it was a hospital-based cross-sectional study that involved 240 mothers of HIV-exposed infants. Information on the socio-demographics of mothers, their knowledge of HIV, its mode of transmission, prevention, and treatment, as well as practices in line with PMTCT interventions, was obtained using an interviewer-administered structured questionnaire. Data was analyzed using SPSS version 26 and p<0.05 was considered statistically significant.* ***Results:*** *a total of 166 (69.2%) and 144 (60.0%) out of the 240 mothers had adequate knowledge and observed appropriate PMTCT of HIV measures respectively. The mean age of the HIV-infected mothers was 31.08 ± 5.65. The maternal age (aOR 0.47; 95% CI 0.13-0.92; p=0.026), duration on ART (aOR 1.97; 95% CI 1.67-4.31; p= 0.004), and HIV status disclosure (aOR 0.391; 95% CI 0.13-0.52; p=0.034) were significant factors associated with knowledge while having an HIV-infected child (aOR 3.30; 95% CI 1.27-5.89; p=0.003) was the only factor associated with the appropriate practice of PMTCT interventions.* ***Conclusion:*** *the knowledge of PMTCT of HIV intervention measures was not commensurate with proper practice. Regular health education of HIV-infected women of childbearing age on PMTCT intervention measures, and providing affordable and accessible maternal healthcare services is recommended.*

Introduction

It is estimated that 38.4 million people are living with HIV globally, out of which an estimated 1.7 million are children aged 0-14 years [1]. Nigeria has the second-highest burden of HIV infection globally, second to South Africa with a 1.9% prevalence rate of HIV in women aged 15-49 years [2,3]. Since more than 90% of HIV transmission in children occurs from the mother to her child, either during pregnancy, childbirth, or breastfeeding, efforts at mitigating the transmission of the virus should be targeted at appropriate prevention of mother-to-child transmission (PMTCT) of HIV interventions. Ensuring that every woman of childbearing age knows her HIV status, pregnant HIV-infected mothers attend antenatal care (ANC) where pregnancy is duly monitored, delivered in a health facility, infants immediately after birth are commenced on post-exposure prophylaxis, exclusive breastfeeding with proper technique and early infant diagnosis carried out within 2 months of age are PMTCT of HIV interventions measures that have proven to be invaluable to reduction of MTCT of HIV [4].

The levels of knowledge of PMTCT of HIV interventions among pregnant women were reported to be 60.7% [5], 77.0% [6], and 83.4% [7] in Nigeria. Previous researchers [6,8,9] reported literacy level, age, exposure to mass/social media, urban dwelling, and higher socio-economic class as factors that influenced good knowledge of PMTCT of HIV in pregnant women. Available data in Nigeria showed poor practice of PMTCT of HIV among pregnant women. Only 54.5% of seropositive pregnant women attending antenatal care took anti-retroviral drugs (ARVs) during pregnancy [7] and only 29.6% of HIV-exposed infants were brought for early infant diagnosis (EID) at 8 weeks [4]. Azuogu *et al*. [7] observed that utilization of PMTCT services for HIV was significantly associated with educational status and occupation. The available research on knowledge and practice of PMTCT of HIV was conducted among pregnant women as such information on knowledge of breastfeeding practices, and early infant diagnosis were omitted. This research, which hypothesized that there is a knowledge gap and inappropriate practices of

PMTCT interventions among nursing mothers, was aimed at assessing the factors that influenced the knowledge and practice of PMTCT measures among HIV-infected nursing mothers. It is hoped that information obtained from this study will help in the awareness creation and sensitization among HIV-infected women of childbearing age on the PMTCT of HIV in pregnancy, during childbirth, and breastfeeding.

Methods

Study design and setting: it was a hospital-based descriptive cross-sectional study, conducted in the paediatric antiretroviral therapy (ART) clinic of Alex Ekwueme Federal Teaching Hospital Abakaliki (AEFUTHA), Ebonyi state. The AEFUTHA is a tertiary hospital located in the state capital and has four major specialties (paediatics, obstetrics and gynaecology, internal medicine, and surgery) domiciled within the hospital. The paediatrics department of AEFUTHA caters to almost all HIV-infected children and adolescents as well as HIV-exposed infants in Ebonyi state, Nigeria. Polymerase Chain Reaction (PCR) is used for the detection of HIV DNA in children within 18 months of age and a serological test is done for children above 18 months of age. The study was conducted between July to December 2022.

Study population: HIV-infected nursing mothers who presented to the paediatric ART clinic with their babies were approached for the study. Only biological mothers and those who gave informed consent were consecutively recruited into the study until the sample size was met. Mothers who declined consent to the study were given routine treatment and care for their HIV-infected children and/or HIV-exposed infants without prejudice. A total sample size of 240 HIV-infected women was enrolled in the study. The sample size was calculated using the formula for descriptive research in a single population [10]. The reported prevalence rate (90%) of knowledge about PMTCT from a similar Ethiopian study was used in calculating the sample size [11]. Assuming a power of 80%, a confidence interval of 95%, and a precision of 4%. An initial sample size of 216 was obtained. We assumed a non-respondent rate of 10% and brought the final sample size to approximately 240 HIV-infected women

Data collection: an interviewer-administered pre-tested questionnaire was used to obtain information about bio-data, educational level, and occupation of mothers and their spouses, place of dwelling, marital status, presence of an HIV-infected child in the family, HIV status disclosure to a spouse, level of knowledge, and practice of PMTCT intervention measures during pregnancy, childbirth, breastfeeding, and postnatal period. The questions were interpreted in English and the study participants' native language to address any source of potential bias. A total of 16 questions (eight each for knowledge and practice) were used to assess knowledge and practices of PMTCT intervention measures. Each question answered correctly had a score of one (1) with a possible score of 0-8 for questions regarding knowledge or practice.

Operational definitions: prevention of mother-to-child transmission (PMTCT) intervention measures assessed in this study were adherence to ART, attendance to antenatal care, delivery in a health facility, nevirapine was given to infants within 72 hours of birth, early infant diagnosis (EID) at 6 weeks, exclusive breastfeeding for 6 months, and cessation of breastfeeding at one year. Adequate knowledge: this is a good and comprehensive understanding of HIV and PMTCT of HIV interventions exhibited by the HIV-infected nursing mothers and assessed by a mean score greater than four or >60% [12]. Similarly, participants were rated as having appropriate practice of PMTCT interventions if they had a mean score of greater than four, as well as >60% of correctly answered questions.

Statistical analysis: the data was entered into Statistical Package for Social Sciences (SPSS) version 26.0 (IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp). Tables were

constructed as appropriate, showing frequencies and percentages of variables. The Chi-square statistic was used to determine the relationship between qualitative variables. Logistic regression analysis was used to determine the factors associated with the knowledge and practice of PMTCT measures. The statistical significance was achieved at $p \leq 0.05$.

Ethical considerations: the study was explained to the HIV-infected nursing mothers, and only those who gave informed consent were included in the study. Ethical approval from the Health Research and Ethical Committee (HREC) of Alex Ekwueme Federal University Teaching Hospital, Abakaliki was obtained. The HREC approval number is NHREC/16/05/22/132.

Results

A total of 247 eligible mothers of HIV-exposed infants who presented to the ART clinic with their infants were approached for the study, but seven of them declined consent. A total of 168 (70.0%) of 240 mothers of HIV-exposed infants that were recruited within the study period were less than 35 years of age, mean age of participants was 31.08± 5.65. The majority (77.9%, 187/240) were literate and 43.3% (104/240) of the participants had been on ART for less than 5 years. A total of 210 (87.5%) were married, 14.6% (35/240) had at least one HIV-infected child, out of which only 3 children were diagnosed with HIV during the study period, and the majority (77.9%, 187/240) had disclosed their HIV status to spouses (Table 1).

Of the 240 participants, 166 (69.2%) had adequate knowledge of HIV and PMTCT of HIV interventions. Only 53.3% (128/240), 54.2% (130/240), and 66.7% (160/ 240) of the participants knew that HIV infection can be transmitted to their unborn babies during pregnancy, childbirth, and breastfeeding respectively. A total of 155 (64.6%) were aware that HIV can be transmitted to newborns through the sharing of sharps, while the majority (87.5%, 210/240) knew that HIV-infected pregnant women should deliver in a health facility. A total of 206 (85.8%) knew that breastfeeding should be stopped at one year of age and 82.9% (199/240) knew that their infants should have nevirapine prophylaxis within 72 hours of birth. The mean knowledge score was 5.25 ± 1.77 as shown in Table 2. One hundred and forty-four (60.0%) mothers observed appropriate practice. Antenatal care attendance in a health facility and adherence to ART in pregnancy were noted to be 70.4% and 80.4% respectively, while only 93 (38.8%) of the 240 participants practiced safer sex in pregnancy. One hundred and forty (58.2%) were delivered in a health facility and 184 (76.7%) received nevirapine suspension within 72 hours of delivery. Early infant diagnosis at 8 weeks was noted in 68.3% (164/240). One hundred and thirty-two (55.0%) practiced exclusive breastfeeding, while 185 (77.1%) stopped breastfeeding at one year. Mean appropriate practices score 3.58 ± 1.44 (Table 3).

Univariable analysis showed that level of literacy (p=0.038), duration of ART (p=0.006), partner´s HIV status (p=0.036), and HIV status disclosure to spouse (p=0.004) were significantly associated with the level of knowledge. Multivariable analysis showed maternal age (aOR: 0.47; 95% CI 0.13-0.92; p=0.026), duration on ART (aOR 1.97; 95% CI 1.67-4.31; p= 0.004), and HIV status disclosure (aOR 0.39; 95% CI 0.13-0.52; p=0.034) were the significant factors associated with adequate knowledge of PMTCT measures (Table 4). The only variable that was associated with appropriate practice PMTCT of HIV after multivariate analysis, among the study participants, was having at least one HIV-infected child (aOR 3.30; 95% CI 1.27-5.89; p=0.003). Mothers who have had an HIV-infected child were thrice more likely to have appropriate practice (Table 5).

Discussion

Nearly 70% of the nursing mothers had adequate knowledge of mother-to-child transmission of HIV, and its prevention, but only 60% of them observed appropriate PMTCT intervention measures. This

study noted significant associations between maternal age, literacy level, duration on ART, HIV status disclosure, and adequate knowledge of PMTCT measures while having at least one HIV-infected child, determined appropriate practice of PMTCT intervention measures among the study participants. The prevention of mother-to-child transmission (PMTCT) of HIV is crucial in decreasing the number of HIV infections among children [13]. The finding from our study that 69.2% of HIV-positive mothers had adequate knowledge of PMTCT is encouraging, as it suggests that awareness-raising campaigns and educational programs aimed at reducing mother-to-child transmission of HIV have had a positive impact on knowledge levels. This should be viewed as a starting point for continued efforts to reduce the mother-to-child transmission of HIV. This finding is comparable to reports from studies done in the Northern part of Nigeria, Zimbabwe, and Rwanda [14-16]; but higher than the findings from observations made by researchers in Ethiopia, and Tanzania [17,18]. Other researchers have reported a higher level of knowledge among the study participants [7,19]. The differences in the percentages of mothers who know about preventing mother-to-child transmission of HIV across studies may be due to variations in study periods and the source populations.

In this study, maternal age, literacy level, the duration of ART, and HIV status disclosure were significantly associated with adequate knowledge among study participants, highlighting the importance of HIV treatment and disclosure in promoting HIV-related knowledge. The positive association between the duration of ART, HIV status disclosure, and HIV knowledge can be attributed to several factors. Individuals who have been on ART for a longer period may have more opportunities to interact with healthcare providers and receive HIV-related education and counseling. Similarly, individuals who have disclosed their HIV status may have access to support groups and other resources that provide HIV-related education and information. Additionally, disclosure may encourage individuals to seek HIV testing and treatment, which can further improve their knowledge and health outcomes. The mother's level of literacy is likely to affect her ability to understand and comply with PMTCT guidelines, highlighting the need for education and awareness-raising campaigns. These findings underscore the need for a comprehensive approach to PMTCT when designing interventions aimed at reducing mother-to-child transmission of HIV addressing both individual and social factors in the prevention of mother-to-child transmission of HIV. Similarly, a study in Ethiopia found a significant association between knowledge and younger age (16 to 24 years) women, urban residence, higher education secondary school and above, employed women, having 5 or more children, and perceived susceptibility to HIV had better knowledge of PMTCT [9]. Other researchers observed that being in the older age group, better education level, being from a rich household, having mass media exposure, and having parity of one and above were associated with higher odds of knowledge about MTCT of HIV/AIDS and its prevention [8,20]. This finding is contrary to reports from Myanmar Southeast Asia, and Hossana Southern Ethiopia [12,21].

The mean appropriate practice level of 60% suggests that although a significant proportion of mothers are taking the necessary steps to reduce the risk of transmitting HIV to their infants, there is still room for improvement, especially for a nation like Nigeria, which contributes the largest to the global burden of mother-to-child-transmission of HIV [4]. Having an HIV-infected child was a significant predictor of good and appropriate practice of PMTCT among the study participants. This is an interesting result that shows the potential impact of personal experience on behaviour change. This result suggests that having a child with HIV may increase the awareness and understanding of the importance of PMTCT among HIV-positive nursing mothers. This finding is consistent with the result of a previous study done in Ethiopia that found personal experience to be a significant predictor of behaviour change related to PMTCT [11].

However, it is important to note that personal experience with HIV is not the only factor that influences behaviour around PMTCT. A study conducted in Myanmar identified additional factors that can influence PMTCT practices which included antenatal care delivery sites, the husband´s support for antenatal care, and taking antenatal services during a previous pregnancy [21]. Other reasons why some mothers are not practicing PMTCT include lack of access to healthcare services, stigma, and fear of discrimination. The finding is in line with reports from Myanmar, Southeast Asia, and Ethiopia [17,21].

This study is limited by its focus on attendees of a health institution, making it difficult to apply the findings to the broader population. The cross-sectional design of the study also makes it challenging to establish causation between exposure and outcome variables. Nevertheless, the study´s multivariate analysis revealed a strong correlation between exposure and outcome variables, providing useful insights to enhance maternal knowledge on preventing mother-to-child transmission of HIV. Despite being limited to a facility-based sample, the findings from the study can assist health service planners in developing strategies to improve knowledge and practice of PMTCT of HIV among HIV-positive mothers with exposed infants.

Conclusion

This study conducted in Abakaliki found that the majority of HIV-infected nursing mothers with exposed children had adequate knowledge, although appropriate practices of PMTCT of HIV measures were not commensurable. The maternal age, literacy level, duration of ART, and HIV status disclosure were factors associated with good knowledge level while having an HIV-infected child predicted appropriate practice of PMTCT of HIV. It is recommended that strategies aimed at teaching HIV and its prevention, provision of PMTCT services, and promotion of its utilization to reduce mother-to-child transmission of HIV and improve health outcomes for women living with HIV infection should be developed.

What is known about this topic

- *Most of the previous studies assessed of knowledge, attitude, and practice of PMTCT interventions in pregnant women and not in nursing mothers;*
- *Studies on knowledge and practice of PMTCT measures on breastfeeding mothers emphasized infant feeding options.*

What this study adds

- *This study assessed factors associated with knowledge and practice of PMTCT intervention measures among HIV-infected nursing mothers;*
- *Maternal age, duration on ART, and HIV status disclosure were found to have significant association with knowledge of PMTCT intervention measures;*
- *Having an HIV-infected child was associated with appropriate practice of PMTCT intervention measures.*

Competing interests

The authors declare no competing interests.

Authors' contributions

Conception and study design: Maria-Lauretta Chito Orji and Chinwe Dorathy Obu. Data collection: Nnamdi Benson Onyire and Maria-Lauretta Chito Orji. Data analysis and interpretation: Chijioke Ogodo Ogeh, Oluchukwu Cecilia Oyim-Elechi, and Sunday Ogo Nweke. Manuscript drafting: Chinwe Dorathy Obu. Manuscript revision: Maria-Lauretta Chito Orji, and Oluchukwu Cecilia Oyim-Elechi. Guarantor of the study: Maria-Lauretta Chito Orji. All authors have read and approved the final version of the manuscript.

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Table 1: socio-demographic characteristics of study participants		
Variables	**Frequency**	**Percentage (%)**
Age (in years)		
<35	168	70.0
≥35	72	30.0
Literacy level		
Primary or less	53	22.1
Secondary or more	187	77.9
Duration on ART		
<5 years	104	43.3
5-10 years	100	41.7
>10 years	36	15.0
Marital status		
Married	210	87.5
Divorced	7	2.9
Single	23	9.6
Have an HIV-infected child		
Yes	35	14.6
No	205	85.4
Partner's HIV status		
Positive	103	42.9
Negative	110	45.8
Don't know	27	11.3
HIV status disclosure		
Yes	187	77.9
No	53	22.1

Table 2: knowledge of study participants on MTCT intervention measures	
Variables	**Frequency (%)**
HIV transmission from the mother to her baby can occur during pregnancy	
Yes	128 (53.3)
No	98 (40.8)
Don' t know	14 (5.8)
HIV transmission from mother to child can occur during childbirth	
Yes	130 (54.2)
No	92 (38.3)
Don' t know	18 (7.5)
HIV transmission from mother to child can occur during breastfeeding	
Yes	160 (66.7)
No	71 (29.6)
Don' t know	9 (3.8)
HIV transmission from mother to child can be through the sharing of sharps	
Yes	155 (64.6)
No	66 (27.5)
Don't know	19 (7.9)
Where should an HIV-infected woman deliver her baby?	
At a health facility	210 (87.5)
In a maternity home	27 (11.3)
At home with a birth attendant	3 (1.2)
An HIV-infected child should not be given formula feeds along with breast milk (mixed feeding)	
Yes	133 (55.4)
No	86 (35.8)
Don't know	21 (8.8)
How long should an HIV-infected mother breastfeed her baby?	
One year	206 (85.8)
>One year	21 (8.8)
Don' t know	13 (5.4)
When should an HIV-exposed infant get nevirapine prophylaxis	
Within 72 hours of birth	199 (82.9)
Any time after birth	27 (11.3)
Don't know	14 (5.8)
Assessment of level of knowledge	
Good knowledge (score >4)	166 (69.2)
Poor knowledge (score ≤4)	74(30.8)
The mean knowledge score was 5.25 ± 1.77	
MTCT: mother-to-child transmission	

Table 3: practices regarding PMTCT measures observed among study participants	
Variables	**Frequency (%)**
Attendance of antenatal care in a health facility	
Yes	169 (70.4)
No	71 (29.6)
Adherent to ART in pregnancy	
Yes	193 (80.4)
No	47 (19.6)
Practiced safer sex in pregnancy	
Yes	93 (38.8)
No	147 (61.2)
Place of delivery of the exposed infant	
Health facility	140 (58.2)
Maternity centre	78 (32.5)
Home	22 (9.2)
The infant received nevirapine within 72 hours of birth	
≤ 72hours	164 (68.3)
>72 hours	59 (24.6)
None	17 (7.1)
The infant had the first PCR test within 8 weeks (early infant diagnosis)	
Yes	184 (76.7)
No	56 (23.3)
The mother who practiced exclusive breastfeeding for 6 months	
Yes	132 (55.0)
No	108 (45.0)
Mother stopped breastfeeding at one year of age	
Yes	185 (77.1)
No	55 (22.9)
Assessment of appropriate PMTCT practice	
Appropriate practices (score >4)	144 (60.0)
Poor practices (score ≤4)	96 (40.0)
Mean appropriate practices score 3.58 ± 1.44	
PMTCT: practice of prevention of mother-to-child transmission, ART: antiretroviral therapy, PCR: polymerase chain reaction	

Table 4: logistic regression analysis on determinants of good knowledge of PMTCT among participants				
Variables	**uOR (95% CI)**	**p**	**aOR (95% CI)**	**P**
Maternal age				
< 35 years	0.41 (0.31-1.26)	0.077	0.47 (0.13-0.92)	0.026
≥ 35 years			1	
Literacy level				
Primary or less			1	
Secondary or more	0.49 (0.37-0.83)	0.038	0.53 (0.12-1.76)	0.068
Duration on ART				
< 5years			1	
5-10 years	1.65 (1.43-3.98)	0.006	1.97 (1.67-4.31)	0.004
>10 years	1.53 (1.17-3.56)	0.021	1.41 (1.12-3.23)	0.039
Have an HIV-infected child				
Yes	1.86 (1.02-8.34)	0.096	1.91 (1.04-9.82)	0.131
No			1	
HIV status disclosure				
Yes	0.63 (0.14-0.76)	0.004	0.39 (0.13-0.52)	0.034
No			1	
*aOR: Adjusted odd ratio, uOR: Unadjusted odds ratio, CI: Confidence interval, ART: antiretroviral therapy, HIV: human immunodeficiency virus, PMTCT: prevention of mother-to-child transmission				

Table 5: logistic regression analysis on the determinants of appropriate practices of PMTCT among participants				
Variables	**uOR (95% CI)**	**p**	**aOR (95% CI)**	**p**
Mother's age				
< 35 years			1	
≥ 35 years	1.24 (0.52-4.91)	0.886	1.36 (0.65-5.38)	0.346
Literacy level				
Primary or less			1	
Secondary or more	0.62 (0.13-1.68)	0.127	0.69 (0.11-1.74)	0.286
Duration on ART				
< 5years			1	
5-10 years	1.05 (0.38-8.87)	0.858	1.08 (0.34-9.02)	0.708
>10 years	1.18 (0.67-4.73)	0.730	1.16 (0.89-4.71)	0.462
Marital status				
Married			1	
Divorced	1.56 (0.43-10.96)	0.137	1.51 (0.46-11.03)	0.444
Single	1.53 (0.91-5.66)	0.428	0.95 (0.26-5.87)	0.961
Have an HIV-infected child				
Yes	3.51 (1.34-5.61)	0.003	3.30 (1.27-5.89)	0.003
No			1	
HIV status disclosure				
Yes	0.62 (0.11-1.50)	0.065	0.64 (0.13-1.52)	0.282
No			1	
*aOR: Adjusted odd ratio, uOR: Unadjusted odds ratio, CI: Confidence interval, ART: antiretroviral therapy, HIV: human immunodeficiency virus, PMTCT: prevention of mother-to-child transmission				