Texila International Journal of Public Health
ISSN: 2520-3134
DOI: 10.21522/TIJPH.2013.13.01.Art009

A Cross-Sectional Assessment of PMTCT Service Delivery in the Era of Expanded Community-Based Programming for Pregnant Women Living with HIV in Akwa-Ibom State, Nigeria

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Abstract

This study assessed the knowledge of mother-to-child transmission (MTCT) of HIV/AIDS and the determinants of this knowledge among women living with HIV who received PMTCT services in Akwa Ibom State, Nigeria. This cross-sectional study used data from a structured questionnaire from postpartum mothers living with HIV who were at least two months post-partum between January – March 2023 and had received PMTCT services during the PMTCT scale-up period (January 2022 – December 2022) across 13 health facilities in Akwa Ibom, Nigeria. Knowledge of PMTCT was categorized as 'good' if participants scored ≥ cut-off score using the demarcation threshold formula. Proportions of women with good knowledge of PMTCT services were compared using the Chi-square test, while logistic regression was used to identify factors associated with good PMTCT knowledge. All analyses were conducted using STATA 14.0. Of the 631 women, 215 (34.1%) were identified and enrolled on PMTCT at community birth centres, while 416 (65.9%) were at the health facility. Overall, 82.2% (518/630) of respondents had good knowledge of PMTCT, and higher among respondents from health facilities (n = 86%, 358/415), compared to those from the community birth centres (n = 74%, 160/215, p<0.001). Among respondents who were identified in the community birth centres, PMTCT knowledge was 2.5 times higher among those residents in the urban compared to those residents in the rural area (aOR=2.522; 95%CI = 1.025-6.202). To improve PMTCT knowledge, targeted information should be provided to women receiving prenatal care at community birth centres and those living in rural areas.

Keywords: *Community birth Centers, Cross-Sectional Study, Knowledge, Nigeria, PMTCT, Women Living with HIV.*

Introduction

Globally, an estimated 1.3 million women living with HIV (WLHIV) become pregnant every year, and without treatment, approximately 15–30% of infants born to these women will acquire HIV during pregnancy and delivery, with an additional 5–15% of infants acquiring HIV through breastfeeding [1-4]. Nigeria is one of two Global Alliance countries where vertical transmission rates are not declining, and only 33% of pregnant and breastfeeding women living with HIV are receiving antiretroviral therapy ART [5]. Preventing MTCT is a critical component of efforts to eliminate pediatric HIV [5, 6], and this depends heavily on the knowledge and practices of women living with HIV (WLHIV). Without adequate knowledge about vertical transmission and the package of PMTCT care

Received: 25.09.2024 ***Accepted:18.02.2025*** ***Published on: 28.03.2025***

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[7], women may not fully adhere to the prescribed interventions, leading to suboptimal outcomes [8, 9].

Akwa Ibom State has the highest HIV prevalence in Nigeria and the majority (76%) of pregnant women receive antenatal services from community birth centers such as those manned by birth attendants [10-12]. Due to the high patronage of community-based antenatal care by pregnant women, Nigeria developed state-specific frameworks for PMTCT scale-up in 2021, expanding primarily HIV counselling and testing services to community birth centers, and capacitating service providers in this setting [13].

While most available studies assessed knowledge of PMTCT services among pregnant women in antenatal care settings, there is a paucity of data on the knowledge of PMTCT services among WLHIV who have received PMTCT services delivery in the era of expanded community-based PMTCT programming. Understanding the level of knowledge of MTCT among WLHIV in this period is crucial for tailoring interventions that can effectively address persisting gaps in understanding and improve adherence to PMTCT protocols. This study aims to assess the knowledge of mother-to-child transmission (MTCT) of HIV/AIDS and identify the determinants of knowledge among women living with HIV who received services during the PMTCT scale-up in Akwa Ibom State, Nigeria.

Methods

Study Design

This was an analytical cross-sectional study conducted in Akwa-Ibom State, South-South Nigeria.

Study Setting

Akwa Ibom State, has an estimated population of 5.4 million, an HIV prevalence of 10.9% among pregnant women in 2012 and 5.5% among the general population in 2018 [14, 15]. The state has thirty-one (31) Local Government Areas. Across the state pregnant women access antenatal care (ANC) at health facilities and community birth centers. HIV testing services are provided to pregnant women attending ANC both at the health facilities and community birth centers while other PMTCT services are health facility-based [12].

Facility Selection

A multistage sampling method was used for selecting the facilities for the study. The first stage utilized a simple random sampling by balloting to select seven out of the 31 Local government areas in Akwa-Ibom State. In the second stage, a purposive selection of 13 health facilities across strata (5 primary, 7 secondary and 1 tertiary) was done out of the 46 LGAs. The last stage has all the health records of women living with HIV who presented for post-delivery PMTCT services at the study sites reviewed by the service providers.

Study Population

The study focused on postpartum women living with HIV (WLHIV) who received antenatal care from January 2022 to December 2022 (the national PMTCT scale-up period) and attended post-delivery PMTCT services between January 2023 and March 2023. To ensure that the minimum prevention package for HIV-exposed infants had been provided, only women who were at least two months postpartum were included in the study.

Participant Selection

Between January and March 2023, the health records of women living with HIV who presented for post-delivery PMTCT services at the study sites were reviewed by the service providers. Those eligible for inclusion in the study based on the criteria earlier stated were referred to the research assistants for informed consent and enrolment. Clients who consented to participate in the study were informed of the study objectives, and duration of the interview (between 30 – 45 mins), assured of their

confidentiality, and assigned a unique study identifier.

Data Collection

Trained research assistants interviewed women who consented to the study using a structured questionnaire on the Open Data Kit. The questionnaire accessed knowledge of PMTCT services as a composite score of seven questions developed based on the expectations for PMTCT services delivery on the National guidelines for PMTCT [6, 18]: the questions assessed knowledge on route and timing of vertical transmission, the effect of maternal ART on vertical transmission, the timing of commencement of antiretroviral prophylaxis, impact of breastfeeding on vertical transmission, mode of delivery for PMTCT and the timing for HIV testing for exposed infants. The interactions were in English or the local dialects depending on the client's preference.

Data Processing

Data extracted from the Open Data Kit was exported to Microsoft Excel for analysis. This includes the age at antenatal enrolment, LGA of residence, educational qualification, parity and place of antenatal care in index pregnancy. Parity refers to the number of live births a woman has had before her current pregnancy. The age at antenatal enrolment was categorized into 10-24 years, 25-34 years and ≥ 35 years; LGA of residence into rural and urban; education into no education, primary, secondary and higher education, and place of first antenatal care in index pregnancy into facility-based and community-based setting [12].

The knowledge of PMTCT was measured from the total number of correct answers to the seven knowledge questions, with a minimum score of 0 and a maximum of 7. The women's knowledge of the PMTCT program was considered "good" if they scored greater than or equal to the cut-off score using the demarcation threshold formula: ([(total highest score-total lowest score)/2] + Total lowest score), and "poor" if otherwise.

Data Analysis

Data on the clients' demographics and their responses to each question were stratified into community- and facility-based settings and summarized using descriptive statistics (frequencies and percentages). The proportions of participants with good knowledge of PMTCT services were compared using the Chi-square test. A logistic regression model was used to calculate the odds ratios (OR) and their corresponding 95% confidence intervals (CI) to identify factors associated with knowledge of PMTCT services. All analyses were done using STATA 14.0 with a significant p-value ≤0.05.

Ethics

The research protocol was reviewed by the Nigerian National Institutional Research Ethics Committee (NHREC).

Results

The records of 758 women living with HIV who attended antenatal care between January and December 2022 were reviewed, and 721 (95.1%) were eligible for inclusion in the study. However, only 631 (87.5%) visited the health facility for post-delivery PMTCT services within the study period and consented to participate in the study. Of these 631 women, 215 (34.1%) received their first antenatal care at community birth centers, and 416 (65.9%) in the health facility (Table 1).

Of the 215 women who received their first antenatal care in community birth centres, the majority (63.4%) were between ages 25 and 34 years, 74.9% were residents in rural LGAs and 65.6% had at least secondary education. Of the 416 women who received their first antenatal care in health facilities, the majority (72.4%) were between ages 25 and 34 years, 52.4% were residents in rural LGAs and 87.0% had at least secondary education (Table 1).

Table 1. Demographic Characteristics of 631 Women Living with HIV who Received Antenatal Care During the PMTCT Scale-up Period and Presented for Post-Delivery PMTCT Services at the Study Sites in Akwa Ibom, Nigeria

Characteristics		**Community Birth Centre (n = 215)**		**Health Facility(n=416)**		p-value
		Frequency	Percent (%)	Frequency	Percent (%)	
Age at antenatal enrolment (in years)						
	10-24	55	25.8%	50	12.1%	<0.001
	25-34	135	63.4%	300	72.5%	
	≥35	23	10.8%	64	15.4%	
	missing	2		2		
LGA Residence						
	Urban	54	25.1%	202	48.6%	<0.001
	Rural	161	74.9%	214	52.4%	
Education						
	No education	4	1.9%	5	1.2%	<0.001
	Primary	70	32.5%	49	11.8%	
	Secondary and higher	141	65.6%	362	87.0%	
Parity						
	1	44	22.0%	82	21.9%	0.252
	2	53	26.5%	121	32.4%	
	3	63	31.5%	99	26.5%	
	4	29	14.5%	41	11.0%	
	>=5	11	5.5%	31	8.2%	
	missing	15		42		
	Median (interquartile range)	2 [2-3]		2 [2-3]		

Overall Knowledge of PMTCT Services Among Women Living with HIV

The mean knowledge score was 64%, based on the demarcation threshold, and 82.2% (518 out of 630) of the women scored above this threshold. Women who accessed their first antenatal care at a health facility had a higher knowledge of PMTCT services compared to those who had their first antenatal care at community birth centres (86% vs. 74%, $p < 0.001$) (Figure 1).

Knowledge of PMTCT Services among Women Living with HIV Disaggregated the Matic Areas

The women demonstrated good knowledge in four of the six PMTCT service areas assessed: routes and timing of vertical transmission, the effect of maternal ART on vertical transmission, timing of antiretroviral prophylaxis initiation, and timing for HIV testing for exposed infants. However, their knowledge was suboptimal in understanding the impact of breastfeeding on

vertical transmission and the appropriate mode of delivery for PMTCT (Table 2).

Women who accessed their first antenatal care at a health facility had significantly higher knowledge in several areas compared to those who received their first antenatal care at community birth centres: routes of vertical transmission (78.2% vs. 62.2%, p < 0.001), the timing of antiretroviral prophylaxis initiation (97.1% vs. 91.2%, p = 0.001), and the impact of breastfeeding on vertical transmission (51.5% vs. 40.5%, p = 0.009). In contrast, women who accessed their first antenatal care at community birth centres had significantly higher knowledge about the appropriate mode of delivery for PMTCT compared to those who received their first antenatal care at a health facility (71.6% vs. 51.6%, p < 0.001) (Table 2).

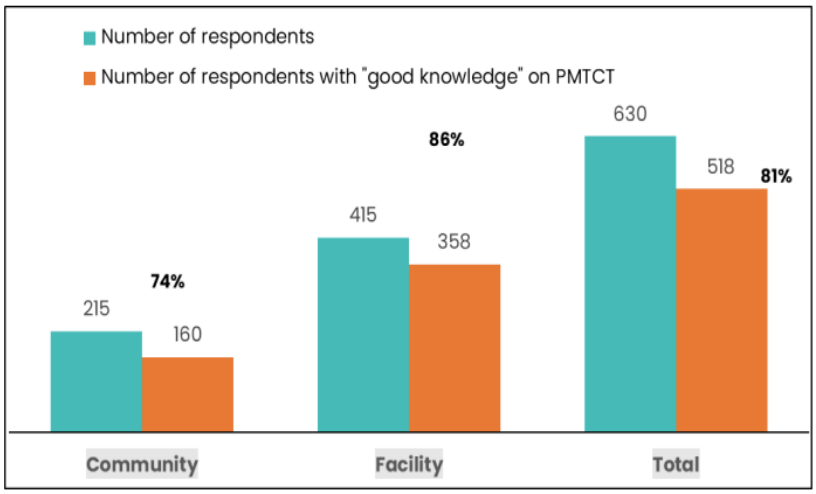

Figure 1. Knowledge of PMTCT Services among Women Living with HIV who Received Antenatal Care During the PMTCT Scale-up Period and Presented for Post-Delivery PMTCT Services, Disaggregated by the Place of First Antenatal Care in Akwa Ibom, Nigeria

Pearson Chi2(1) = 13.5974 p = <0.001

Table 2. Comparison of PMTCT Knowledge Across Thematic Areas among Women Living with HIV who Presented for Post-Delivery PMTCT Services, Disaggregated by the Place of First Antenatal Care in Akwa Ibom, Nigeria

Knowledge on PMTCT	**All**			**Community**			**Facility**			p-value*
	Total responses	correct response	% correct responses	Total responses	correct response	% correct responses	Total responses	correct response	% correct responses	
• HIV could be transmitted from an infected [i. mother; ii. Father; iii. Sibling; to the family's newborn child.]	627	456	72.7%	214	133	62.2%	413	323	78.2%	<0.001
• MTCT could happen through i.	629	434	69.0%	214	148	69.2%	415	286	68.9%	0.95

Pregnancy; ii. Delivery; iii. Breastfeeding										
• What is the recommended time of initiation of antiretroviral prophylaxis for the newborn	630	599	95.1%	215	196	91.2%	415	403	97.1%	0.001
• Can abstinence from breastfeeding reduce MTCT?	629	300	47.7%	215	87	40.5%	414	213	51.5%	0.009
• Can abstinence from ART reduce MTCT?	630	613	97.3%	215	207	96.3%	415	406	97.8%	0.254
• Preferable mode of delivery to reduce MTCT	630	368	58.4%	215	154	71.6%	415	214	51.6%	<0.001
• What is the recommended time for infant HIV testing	629	566	90.0%	214	188	87.9%	415	378	91.1%	0.201

***** *P-Value Based on Chi-Square Test*

Determinants of Good Knowledge of PMTCT Services among Women Living with HIV

Women who resided in urban areas and received their first antenatal care from community birth were 2.5 times more likely to have good knowledge of PMTCT services compared to those residing in rural areas who received their first antenatal care at community birth centres (aOR = 2.522; 95% CI = 1.025–6.202). All other factors were comparable between groups (Table 3).Table 3: Determinant of "good knowledge" by respondents' characteristics.

Table 3. Determinants of Good Knowledge on PMTCT Services Among Women Living with HIV Women who Presented for Post-Delivery PMTCT Services, Disaggregated by the Place of First Antenatal Care in Akwa Ibom, Nigeria

Characteristics		**Community**		**OR [95% CI]**	**AOR [95% CI]**	**Facility**		**OR [95% CI]**	**AOR [95% CI]**
		Total	**Have "good" knowledge****			**Total**	**Have "good" knowledge**		
Age at Antenatal Enrolment (In Years)									
	10-24	55	41(74.6%)	0.279 (0.058-1.344)	0.244 (0.049-1.217)	50	44 (88.0%)	1.222 (0.404-3.698)	1.269 (0.413-3.901)

	25-34	135	97 (71.9%)	0.243 (0.0543-1.087)	0.262 (0.0568-1.208)	300	259 (86.3%)	1.053 (0.483-2.294)	0.998 (0.450-2.213)
	>35	23	21 (91.3%)	Reference	Reference	63	54 (85.7%)	Reference	Reference
LGA Residence									
	Urban	54	46 (85.2%)	2.371 (1.040-5.405)	2.522 (1.025-6.202)*	201	178 (88.6%)	1.462 (0.828-2.580)	1.358 (0.732-2.519)
	Rural	161	114 (70.8%)	Reference	Reference	214	180 (84.1%)	Reference	Reference
Education									
	No education	4	3 (75.0%)	0.991 (0.099-9.833)	0.818 (0.065-10.294)	5	4 (80.0%)	0.658 (0.072-6.006)	0.765 (0.081-7.229)
	Primary	70	51 (72.9%)	0.886 (0.462-1.699)	0.810 (0.399-1.645)	49	44 (89.8%)	1.448 (0.548-3.824)	1.399 (0.515-3.806)
	Secondary and higher	141	106 (75.2%)	Reference	Reference	361	310 (85.9%)	Reference	Reference
Parity									
	1	44	32 (72.7%)	0.593 (0.112-3.147)	0.511 (0.091-2.873)	81	71 (87.7%)	1.052 (0.304-3.640)	1.043 (0.299-3.636)
	2	53	42 (79.3%)	0.848 (0.159-4.506)	0.791 (0.141-4.430)	121	107 (88.4%)	1.132 (0.345-3.717)	1.075 (0.325-3.557)
	3	63	44 (69.8%)	0.515 (0.101-2.611)	0.492 (0.093-2.616)	99	81 (81.8%)	0.667 (0.207-2.143)	0.672 (0.206-2.188)
	4	29	22 (75.9%)	0.698 (0.121-4.029)	0.608 (0.099-3.717)	41	35 (85.4%)	0.864 (0.222-3.371	0.839 (0.213-3.300)
	>=5	11	9 (81.8%)	Reference	Reference	31	27 (87.1%)	Reference	Reference

********Based on this Formula (Total Highest Score-Total Lowest Score)/2} + Total Lowest Score), the Knowledge Threshold was Set at the Score >64%*

Discussions

This study assessed the knowledge of mother-to-child transmission of HIV/AIDS and determinants of knowledge among women living with HIV who received PMTCT services from facility and community birth centers during the era of the Nigerian national PMTCT scale-up program in Akwa Ibom State, Nigeria. Overall, we found that the knowledge of PMTCT among participants was more than the average knowledge threshold. Also, the Knowledge of PMTCT was higher among respondents at health facilities compared to those at the community birth centres. Among respondents at community birth centres, PMTCT knowledge was 2.5 times higher

among residents in urban areas compared to residents in rural areas.

The overall knowledge score of 64% was higher than the estimated pooled knowledge of PMTCT (62.15%) among women of reproductive age from a systematic review in Ethiopia [16], and 56.21% from a systematic review among women of reproductive age across 33 countries in sub-Saharan Africa [17]. This suggests that the PMTCT scale-up program in Akwa Ibom State has been effective in disseminating information on PMTCT among women of reproductive age but leaves room for additional efforts in improving PMTCT knowledge among WLHIV.

In this study, 82% of the women who attended antenatal care had optimal knowledge across the seven subject matters assessed on PMTCT.

The high percentage of correct responses to questions about ART's role in reducing MTCT, the recommended timing for ART prophylaxis in newborns, and the timing of infant HIV testing indicate that key aspects of PMTCT are well disseminated and understood by most women. However, the finding that only 47.7% of participants knew that abstinence from breastfeeding can reduce MTCT highlights a significant knowledge gap. This is particularly concerning in the Nigerian context, where breastfeeding is culturally normative [18, 19], and there is a substantial risk of HIV transmission through breast milk [20, 21]. The low awareness of this transmission route could undermine the overall effectiveness of PMTCT efforts [39], especially in areas where exclusive breastfeeding is not feasible or safe alternatives to breastfeeding are not readily available.

Women from health facilities had significantly higher PMTCT knowledge (86%) compared to their counterparts from community birth centres (74%). This may be attributed to differences in the educational levels of participants seen across both settings, where, 87% of the women in the facility setting had attained secondary education, compared to 66% in the community setting. This association between educational attainment and knowledge about PMTCT aligns with several theoretical perspectives as explained by Terefe et al [22]. According to Terefe, one such framework is the Health Belief Model (HBM), which suggests that individuals' health-related beliefs and perceptions influence their adoption of preventive behaviours. In this context, educated women may have a higher level of perceived susceptibility to HIV/AIDS and recognize the significance of PMTCT knowledge in protecting their health and that of their children [23-25]. The association was further explained in resonance with the Diffusion of Innovations theory [26], which posits that knowledge and new ideas are more readily adopted by individuals with higher education levels.

The study had limitations. Because the study relied on responses from a cohort of women who returned to the health facility post-partum, this population may be positive health seekers, and thus their knowledge of PMTCT standards may be better than those who did not return for follow-up PMTCT services. To address this, efforts were made to track, locate and return to care defaulters through the PMTCT continuum. Despite this limitation, this is one of the few papers that have assessed knowledge of PMTCT services among women living with HIV including services for their exposed infants.

Conclusion

The study findings reveal over 82% of the women who attended antenatal care had optimal knowledge across the six thematic areas assessed on PMTCT services; higher among respondents from health facilities compared to those from community birth centres. To reduce vertical transmission and new infection among children, PMTCT-related information such as appropriate breastfeeding options to reduce MTCT is crucial, especially among women residing in rural areas.

Author Contributions

All authors made substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; agreed on the journal to which the article will be submitted; gave final approval of the version to be published; and agreed to be accountable for all aspects of the work.

Funding

The authors received no funding for this work.

Disclosure

The authors declare no potential conflicts of interest.

Data Availability Statement

The data will be made available by authors on request.

References

[1]. UNAIDS, 2023, HIV & AIDS statistics — Fact sheet, https://www.unaids.org/en/resources/fact-sheet

[2]. World Health Organization, 2016, Consolidated guidelines on the use of antiretroviral drugs for treating and preventing HIV infection. Recommendations for a public health approach, second edition. Geneva. https://apps.who.int/iris/handle/10665/208825

[3]. UNAIDS, 2014, The Gap Report.2014. Children and pregnant women living with HIV. Geneva: Joint United Nations Program on HIV/AIDS (UNAIDS), http://www.unaids.org/sites/default/files/ media asset/0._ChildrenandpregnantwomenlivingwithHIV.pdf, accessed 10 August 2024.

[4]. WHO, 2018, HIV diagnosis and ARV use in HIV-exposed infants: a programmatic update. Geneva: World Health Organization, https://apps.who.int/iris/bitstream/handle/10665/273155/WHOCDS-HIV-18.17-eng.pdf, accessed 10 August 2024.

[5]. UNAIDS, 2024, Transforming Vision into Reality: The 2024 Global Alliance Progress Report on Ending AIDS in Children by 2030. Geneva: License: CC BY-NC-SA 3.0 IGO, https://www.unaids.org/en/resources/documents/2024/transforming-vision-into-reality

[6]. UNAIDS, 2021, Start free, stay free, AIDS free: Final report on 2020 targets. Joint United Nations Program on HIV/AIDS (UNAIDS), https://www.unaids.org/sites/default/files/media_asset/2021_start-free-stay-free-aids-free-final-report-on-2020-targets_en.pdf

[7]. Federal Ministry of Health Nigeria, 2020, National Guidelines for HIV Prevention, Treatment and Care, https://nascp.gov.ng/resources/get_resource_doc/31

[8]. Ciampa P. J., Skinner S. L., Patricio S. R., Rothman R. L., Vermund S. H., Audet C. M., 2012, Comprehensive Knowledge of HIV among Women in Rural Mozambique: Development and Validation of the HIV Knowledge 27 Scale. *PLoS One*. Oct 31;7(10).

[9]. Darteh K. M., Abraham S. A., Seidu A. A., Chattu V. K., Yaya S., 2021, Knowledge and determinants of women's knowledge on vertical transmission of HIV and AIDS in South Africa. AIDS Res Ther. 18(1):1–9, https://aidsrestherapy.biomedcentral.com/articles/10.1186/s12981-021-00367-7

[10]. Federal Ministry of Health, 2019, Nigeria HIV/aids indicator and impact survey (NAIIS) 2018: Technical report, https://www.naiis.ng/resource/factsheet/NAIIS%20PA%20NATIONAL%20FACTSHEET%20FINAL.pdf

[11]. Eshiet U. I., Jackson I. L., Akwaowoh A. E., 2016, High patronage of traditional birth homes: a report from Akwa Ibom, Southern Nigeria. *AASCIT J Health*; 3: 1–6. https://www.researchgate.net/publication/360485979_High_Patronage_of_Traditional_Birth_Homes_A_Report_from_Akwa_Ibom_Southern_Nigeria

[12]. Nwanja E., Akpan U., Toyo O.., et al., 2023, Improving access to HIV testing for pregnant

women in community birth centers in Nigeria: an evaluation of the Prevention of Mother-to-Child Transmission program. Ther Adv Infect Dis. Apr 29;10:20499361231172088. doi: 10.1177/20499361231172088. PMID: 37152184; PMCID: PMC10155002.

[13]. Centre for Disease Control (CDC), 2022, US CDC Launches AP3 Program to Expand HIV Treatment Coverage Among Pediatrics, Adolescents, and Pregnant Women. U.S. Embassy & Consulate in Nigeria, https://ng.usembassy.gov/us-cdc-launches-ap3-program-to-expand-hiv-treatment-coverage-among-pediatrics-adolescents-and-pregnant-women/#:~:text=The%20AP3%20program%20aims

[14]. Population. City, 2021, http://population.city/nigeria/adm/akwa-ibom/

[15]. Nigeria Galleria. n.d. "Business Economy of Akwa Ibom State". https://www.nigeriagalleria.com/Nigeria/States_Nigeria/Akwa-Ibom/Business-Economy-Akwa-Ibom-State.html

[16]. Kassie S. Y., Chereka A. A., Damtie Y., 2022, Systematic review and meta-analysis of knowledge on PMTCT of HIV/AIDS and Association factors among reproductive age women in Ethiopia. BMC Infect Dis. 23(1):491. doi: 10.1186/s12879-023-08461-z. PMID: 37491184; PMCID: PMC10367387.

[17]. Teshale A. B., Tessema Z. T., Alem A. Z., Yeshaw Y., Liyew A. M., Alamneh T.S, et al., 2021, Knowledge about mother to child transmission of HIV/AIDS, its prevention and associated factors among reproductive-age women in sub-Saharan Africa: Evidence from 33 countries recent Demographic and Health Surveys. *PLoS ONE* 16(6): e0253164.
https://doi.org/10.1371/journal.pone.0253164

[18]. Akadri A., Odelola O., 2020, Breastfeeding Practices among Mothers in Southwest Nigeria. *Ethiop J Health Sci*. 30(5):697-706. doi: 10.4314/ejhs.v30i5.8. PMID: 33911830; PMCID: PMC8047277,
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8047277/

[19]. Anaba, U.C., Johansson, E.W., Abegunde, D. et al., 2022, The role of maternal ideations on breastfeeding practices in northwestern Nigeria: a cross-section study. *Int Breastfeed J.* 17 (63), https://doi.org/10.1186/s13006-022-00500-w

[20]. Njom A. E., 2022, Mother-to-Child Transmission of HIV Through Breastfeeding Improving Awareness and Education: A Short Narrative Review. Int J Women's Health. 14:697-703. doi: 10.2147/IJWH.S330715. PMID: 35601795; PMCID: PMC9114103. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9114103/

[21]. Umeobieri, A. K., Mbachu, C., Uzochukwu, B., et al., 2018, Perception and practice of breastfeeding among HIV positive mothers receiving care for prevention of mother to child transmission in South-East, Nigeria. *Int Breastfeed J.* 13 (50), https://doi.org/10.1186/s13006-018-0191-8

[22]. Terefe B., Jembere M. M., Liyew B., 2024, Comprehensive knowledge of mother-to-child HIV/AIDS transmission, prevention, and associated factors among reproductive-age women in East Africa: insights from recent demographic and national health surveys. BMC Women's Health. 24(1):318. doi: 10.1186/s12905-024-03173-1. PMID: 38824575; PMCID: PMC11143582. https://bmcwomenshealth.biomedcentral.com/articles/10.1186/s12905-024-03173-1

[23]. Strecher V. J., Champion V. L., Rosenstock I. M., 1997, The health belief model and health behavior.
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4530978/

[24]. Jeihooni A. K., Arameshfard S., Hatami M., Mansourian M., Kashfi S.H., Rastegarimehr B., et al., 2017, The effect of educational program based on health belief model about HIV/AIDS among high school students. *Int J Pediatrics-Mashhad.* 6(3):7285–96.
https://doi.org/10.22038/ijp.27226.2343.

[25]. Tarkang E. E., Zotor F. B., 2015, Application of the health belief model (HBM) in HIV prevention: a literature review. *Cent Afr J Public Health*. 1(1):1–8. https://www.researchgate.net/publication/317493239.

[26]. Bertrand J. T., 2004, Diffusion of innovations and HIV/AIDS. *J Health Communication*. 9(S1):113–21. doi: 10.1080/10810730490271575. https://pubmed.ncbi.nlm.nih.gov/14960407/