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Knowledge, Attitude and Utilization of Prevention of Mother-to-Child Transmission of HIV (PMTCT) Services among Pregnant and Postpartum HIV-Positive Women in Enugu Metropolis

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Abstract

Background: This study was conducted to determine the level of knowledge, attitude, and utilization of Prevention of Mother-to-Child Transmission of HIV (PMTCT) services among pregnant and HIV-Positive postpartum women living in Enugu Metropolis, Nigeria.

Methods: It is a cross-sectional descriptive survey design involving 96 participants who were recruited from selected nine (9) healthcare centers in Enugu between October and November 2023. Data collection was through structured questionnaire interviews that focused on awareness and knowledge of PMTCT services, respondents' attitudes towards PMTCT, and service utilization patterns.

Results: The study indicated a high level of awareness (85.4%) and knowledge (79.1%) of PMTCT services among study participants. Fair (65.6%) attitudes towards PMTCT services were predominant. Statistically significant associations were observed between attitude and education (χ^2 = 15.663, df = 6, p=0.016) and occupation status (χ^2 = 18.125, df = 6, p=0.006). PMTCT service utilization by 55.2% of participants, took place during pregnancy and post-delivery; and ART was the most utilized PMTCT service (70.8%). There was a significant association between knowledge of PMTCT and utilization of PMTCT services (χ^2 = 38.299, df = 6, p = 0.000). Availability of PMTCT facilities and HIV stigmatization were the major facilitator and barrier to PMTCT service utilization respectively.

Conclusion: This study presents the need for targeted provider driven interventions aimed at addressing misconceptions and improving PMTCT services coverage and enhance maternal and child health outcomes in this population of interest.

Keywords: PMTCT; HIV-Positive; Pregnant Women; PMTCT Utilization; HIV Prevention

Abbreviations

PMTCT: Prevention of Mother-to-Child Transmission of HIV; HIV: Human Immunodeficiency Virus; SSA: Sub-Saharan Africa; MTCT: Mother-to-Child Transmission of HIV; ART: Antiretroviral Therapy; NGOs: Non-Governmental Organizations; SPSS: Statistical Package for Social Sciences.

Introduction

Human Immunodeficiency Virus (HIV) has continued to make profound global impact since its emergence in 1981 and it has remained one of the most significant health challenges in modern history [1]. According to the Centers for Disease Control and Prevention (CDC), HIV has resulted in approximately 40.4 million deaths worldwide, with active transmission affecting populations in every country of the world [2]. Despite the scientific advancement over the decades and concerted global efforts, HIV remains devastating especially in developing countries [3]. Its infection and transmission show a sheer gender disparities, as it disproportionately affects women in Sub-Saharan Africa (SSA) and make up majority of the HIV-positive individuals [3]. The complex interchange of factors like socioeconomic factors, cultural norms and belief systems, religious factors and limited access to healthcare facilities in these regions contribute to aggravating the challenges faced by women in seeking and receiving appropriate healthcare services [3].

Nigeria is still grappling with HIV control and substantially contributes to HIV burden both globally and in African continent. Having an adult HIV prevalence of 1.4%, in terms of the number of people living with HIV (PLHIV), Nigeria ranks second globally [4]. Young women, who are aged 15-24 years, have higher infection rates compared to their male counterparts. The urgent need for targeted interventions to address transmission dynamics among young women, is demonstrated by this demographic trend [4].

Mother-to-child transmission of HIV (MTCT) is the primary mode of pediatric HIV infection, and accounts for more than 90% of cases across the globe [5]. Therefore, the Prevention of Mother-to-child Transmission of HIV (PMTCT) during pregnancy, childbirth, and breastfeeding are essential in reducing the risk of transmission from HIV-positive mothers to their newborns [6]. Children born to HIV-positive mothers are usually faced with increased mortality and developmental challenges, without timely PMTCT interventions [7]. The loss of parental care due to HIV-related mortality can compound these challenges [7]. A robust prevention strategy and comprehensive healthcare services for pregnant women living with HIV is of great importance.

Nigeria launched its Prevention of Mother-to-Child Transmission (PMTCT) program in the year 2000, as a response to the soaring challenge of MTCT. The program was expanded nationwide in the year 2002, after initial implementation in selected pilot sites. The program is primarily aimed at reducing the rates of MTCT, using a comprehensive approach that includes antiretroviral therapy (ART), counseling, testing, and infant feeding practices [8]. Significant barriers such as low awareness, stigma, and structural gaps have been witnessed, which have greatly impeded the effectiveness of PMTCT services across Nigeria, despite all the invested efforts [9]. Nigeria has the slowest decline in MTCT in sub-Saharan Africa, while it contributes the most to the number of HIV-positive infants worldwide [9]. In spite of the supports given by various non-governmental organizations (NGOs) towards combating HIV/AIDS, Nigeria recorded a mother-to-child transmission rate of 26.9% [10].

There is documented evidence that the implementation of PMTCT services has faced challenges at various levels: poor knowledge of MTCT and ways of preventing its occurrence, distance and/or cost of getting to medical facilities, unavailability of test kits, poor attitude of healthcare professionals, stigma associated with visit to healthcare and poverty [9,11]. Just like many countries in the SSA, societal norms and limited access to healthcare contribute to disparities in HIV prevention and treatment outcomes in Nigeria, particularly among women of childbearing age [3,10]. These disparities further accentuate the dire need for the implementation of targeted interventions that address not only medical needs, but also sociocultural factors that have impact or influence on health-seeking behaviors.

Increasing the knowledge of pregnant mothers and improving their attitude towards the utilization of PMTCT services, is cost-effective, beyond being one of the pillars of PMTCT [12]. Low level of knowledge [13], attitude [13-15], and practice or utilization [16-19] of PMTCT have been reported in studies conducted across African countries. These are required to ensure proper implementation of PMTCT programmes [13]. In Nigeria, there is a paucity of data on PMTCT effectiveness and pregnant women's knowledge and attitude towards it [20,21]. Therefore, the primary objective of this study is to assess the knowledge, attitudes, and utilization of PMTCT services in Enugu metropolis. This will contribute to addressing the gaps in understanding and uptake of PMTCT services.

Specific Objectives

1. To assess the level of knowledge of PMTCT among pregnant and postpartum HIV-positive woman accessing care in nine selected PMTCT-approved health facilities in Enugu metropolis.

2. To examine their attitudes towards PMTCT, exploring perceptions, beliefs and cultural influences that may impact their engagement with PMTCT services.
3. To investigate the pattern of utilization of PMTCT among pregnant HIV-positive women in those nine selected PMTCT centres, identifying barriers and facilitators to accessing and utilizing these services.

Materials and Methods

Study Location

The study was conducted in Enugu Metropolis, which is the administrative capital of Enugu State – located in the South-Eastern part of Nigeria. The study area is situated within the coordinates of 6˚22'N to 6˚38'N (latitudes) and 7˚28'E to 7˚37'E (longitudes). It is the commercial nerve of the state, with an estimated population of 722,664 [22]. The metropolis hosts a range of healthcare facilities, including general and teaching hospitals, clinics, and primary healthcare centres. Until now coal mining has been the mainstay of the city which is home to civil servants, traders, artisans and a good number of farmers. The rainy or wet seasons and the Harmattan or dry seasons are the two main seasons in the study area [23].

Study Design

For this research a cross-sectional descriptive survey design was used. This study design was chosen because it allowed the researcher to collect data from a representative sample of the population to assess the level of knowledge and utilization of PMTCT services amongst the pregnant and postpartum women living with HIV. Data was collected from the study population across nine (9) PMTCT facilities within Enugu Metropolis, between October and November 2023.

Study Population

The study population comprised all women of child-bearing age (15-45 years) living with HIV who were pregnant or were within a postpartum period of nine months, who were receiving HIV care and treatment at nine PMTCT approved centres in Enugu Metropolis.

Sample Size and Sampling Technique

The population of pregnant and postpartum HIV-positive women accessing care at the nine PMTCT approved centers between October and November 2023 was 96. Therefore, all 96 eligible women were used as the sample size, in accordance with the principle of 'census' which states that when the study population is small, the entire population can be used as the sample size [24,25]. This enhances statistical validity and eliminates sample size related errors.

Inclusion and Exclusion Criteria

To be included in this study, subjects must meet all the following criteria:

- Must be an HIV-positive pregnant or postpartum woman.
- Must be accessing PMTCT services at one of the selected health facilities used in this study.
- Must be 15 years of age or older.

Subjects who did not meet all the inclusion criteria, or who refused consent were excluded from the study.

Data Collection

A well-structured questionnaire was used for data collection. This method was chosen because it suited the research design for the study. The questionnaire was divided into three main sections: A, B, C and D. Section A contained questions aimed at obtaining information on respondents' socio-demographic variables, while section B, C and D contained questions measuring each of the research questions. For positive questions, the highest score was 5 (strongly agree) while the lowest score was 1 (strongly disagree). Conversely, for negative questions, the highest score was 5 (strongly disagree) while the lowest score was 1 (strongly agree).

Data Analysis

Using the questionnaires as source documents, the study data was entered into a Microsoft excel database. The data was then cleaned and coded before importing it into the IBM Statistical Package for Social Sciences (SPSS) software (version 22.0), for analysis. Descriptive statistics were used to present data in tables. Frequency distribution for categorical variables was generated and the relationship between dependent and independent variables such as socio-demographic characteristics of the respondents was computed using Chi-Square inferential statistical analysis.

Results

96 eligible pregnant and postpartum women living with HIV who were accessing care from 9 primary and tertiary healthcare centres in Enugu metropolis between October and November 2023, participated in this study. 96 copies of the questionnaire were properly filled and returned, amounting to a 100 % completion rate (Table 1). Below are the results.

S/N	Variables	Frequency (%)
Age		
1	15 -24	7(7.3)
	25-34	41(42.7)
	35-44	39(40.6)
	45 and older	9(9.4)
	Mean age = 34.76 + 2.33	
What is your highest educational level?		
2	Tertiary education	43(44.8)
	Secondary education	36(37.5)
	Primary education	13(13.5)
	No formal education	4(4.2)
What is your Marital Status?		
3	Married	47(49)
	Single	29(30.2)
	Separated/Divorced	16(16.7)
	Widowed	4(4.2)
What is your Occupation?		
4	Civil servant	33(34.4)
	Businesswoman	22(22.9)
	Unemployed	21(21.9)
	Self-employed	20(20.8)
What is your Religion?		
5	Christianity	93(96.9)
	Islam	2(2.1)
	Traditional religion	1(1)

Table 1: Socio-Demographic Characteristics of the Respondents (n = 96).

The study participants had a mean age of 34.76+2.33 years, with 80(83.3%) of them within the age brackets of 25 - 44 years of age. 95.8% of the respondents had at least primary education, only 4(4.2%) of them had no formal education, while 43(44.8%) of them had tertiary level of education. Majority of the participants, 47(49%), 33(34.4%) and 93(96.9%) were married, civil servants by occupation, and affiliated to Christianity, respectively (Table 2).

Knowledge Level	Frequency (%)
No Knowledge (0)	4(4.2)
Poor Knowledge (1-3)	5(5.2)
Moderate Knowledge (4-5)	11(11.5)
Good Knowledge (6-8)	76(79.1)

Table 2: Knowledge Score (n=96).

Most of the respondents (79.1%), had a good knowledge of PMTCT, 11.5% had a moderate knowledge of PMTCT, 5.2% had a poor knowledge of PMTCT and 4.2% had no knowledge of PMTCT (Table 3).

Attitude Level	Frequency	Percentage (%)
Bad (0-59)	19	19.8
Fair (60-79)	63	65.6
Good (80-100)	14	14.6

Table 3: Attitude towards PMTCT Services Score.

Most of the respondents had a fair attitude (65.6%) towards PMTCT services while (19.8%) and (14.6%) had poor and good attitude towards PMTCT services, respectively (Table 4).

S/N	Variables	Frequency (%)
Have you been pregnant before or are you currently pregnant?		
1	Yes	100(100.0)
	No	0(00.0)
Have you received any PMTCT service before?		
2	Maybe	8(8.3)
	Yes	53(55.2)
	No	35(36.5)
Name the point you can receive PMTCT service (MRA)		
3	After delivery	62(64.6)
	During pregnancy	57(59.4)
	During Labour and delivery	45(46.9)
	I don't know	30(31.3)
4. Please indicate the specific PMTCT service(s) you have utilized (MRA)		
4	Antiretroviral therapy (ART)	68(70.8)
	Counselling on infant feeding options	56(58.3)
	PMTCT education	49(51)
	Viral load estimation at 32-36 weeks	45(46.9)
	HIV counselling and testing for your partner	42(43.8)
	Effective infant feeding counselling	41(42.7)
	Early infant diagnosis blood testing	35(36.5)
	HIV testing service (HTS)	32(33.3)
	None	28(29.2)
	Nevirapine as from 32 weeks	18(18.8)
Were you satisfied with the PMTCT service(s) you have received?		
5	Yes	63(65.6)
	No	33(34.4)
What factors can influence your decision to utilize PMTCT services? (MRA)		
6	Availability of PMTCT services in my place of care	70(72.9)
	Recommendations from healthcare provider	62(64.6)
	Knowledge about the benefits of PMTCT	60(62.5)
	Concerns about the risk of transmitting HIV to my child	54(56.3)
	Family or friends' recommendations	22(22.9)
What challenges do you think are associated with accessing PMTCT services? (MRA)		

7	Fear of stigmatization	56(58.3)
	Poor partner involvement in antenatal care	48(50)
	Poor knowledge of PMTCT among mothers	48(50)
	Inadequate trained health workers to carry out PMTCT	41(42.7)
	Financial barriers	40(41.7)
	Poor attitude of healthcare workers	29(30.2)
	Non-availability of HIV test kits	20(20.8)
Are you likely to utilize PMTCT in your next pregnancy? (n=74)		
8	I am not sure	7(9.5)
	Yes	65(87.8)
	No	2(2.7)

MRA: Multiple Responses Applicable.

Table 4: Utilization of Prevention of Mother-to-Child Transmission Services.

55.2% of the respondents had received PMTCT service(s) in the past but a significant proportion of 36.5% indicated no previous utilization. The most indicated point where PMTCT services were received was after delivery (64.6%) and during pregnancy (59.4%). Antiretroviral therapy (ART) (70.8%), counselling on infant feeding options (58.3%) and PMTCT education (51%), were the most utilized PMTCT services. Most of the respondents were satisfied with the PMTCT service(s) received (65.6%). The major factors that influenced most respondents' decision to utilize PMTCT services were availability of PMTCT services in their place of care (72.9%). The main challenges associated with accessing PMTCT services as indicated by most respondents were fear of stigmatization (58.3%), Poor partner involvement in antenatal care (50%) and Poor knowledge of PMTCT among mothers (50%) (Table 5).

S/N	Variables	Knowledge Level (n = 96)				χ2/p-Value
		No Knowledge (%)	Poor Knowledge (%)	Moderate Knowledge (%)	Good Knowledge (%)	
What is your age range?						
1	45 and older	0(0)	1(11.1)	0(0)	8(88.9)	**26.63, (0.002)*, df=9**
	35-44	3(7.7)	0(0)	11(26.8)	36(92.3)	
	25-34	0(0)	4(9.8)	0(0)	26(63.4)	
	15 -24	1(14.3)	0(0)		6(85.7)	
What is your highest educational level?						
2	No formal education	0(0)	0(0)	0(0)	4(100)	**5.723, (-0.767), df=9**
	Tertiary education	1(2.3)	2(4.7)	6(14)	34(79.1)	
	Secondary education	3(8.3)	3(8.3)	4(11.1)	26(72.2)	
	Primary education	0(0)	0(0)	1(7.7)	12(92.3)	
What is your Marital Status?						
3	Widowed	0(0)	0(0)	0(0)	4(100)	**10.416 (-0.318) df=9**
	Separated/ Divorced	1(6.3)	1(6.3)	2(12.5)	12(75)	
	Married	1(2.1)	2(4.3)	2(4.3)	42(89.4)	
	Single	2(6.9)	2(6.9)	7(24.1)	18(62.1)	
What is your Occupation?						

4	Business woman	1(4.5)	1(4.5)	2(9.1)	18(81.8)	**4.715 (-0.858) df=9**
	Unemployed	1(4.8)	0(0)	2(9.5)	18(85.7)	
	Self-employed	1(5)	2(10)	1(5)	16(80)	
	Civil servant	1(3)	2(6.1)	6(18.2)	24(72.7)	
What is your Religion?						
5	Traditional religion	1(100)	0(0)	0(0)	0(0)	**23.742 ((0.001)* df**
	Christianity	3(3.2)	5(5.4)	11(11.8)	74(79.6)	
	Islam	0(0)	0(0)	0(0)	2(100)	

* Statistically Significant

Table 5: Socio-Demographic Determinants of Knowledge of Prevention of Mother-To-Child Transmission of HIV (PMTCT).

Good knowledge levels were predominantly demonstrated by Participants of the age bracket of 35-44 years (92.3%). Age has significant influence on knowledge levels (χ^2 = 26.630, p = 0.002). Participants with secondary education and tertiary education demonstrated higher rates of good knowledge, at 72.2% and 79.1% respectively; but no statistically significant association between level of knowledge and the level of education (χ^2 = 5.723, p = 0.767), just like in marital status (p-value = 0.318) and Occupation (p-value = 0.858). Religion has statistically significant influence on levels of knowledge (χ^2 = 23.742, p-value = 0.001) (Table 6).

S/N	Variables	Attitude Level (n = 96)			χ2/p-Value
		Bad (%)	Fair (%)	Good (%)	
What is your age range?					
1	45 and older	1(11.1)	8(88.9)	0(0)	**7.107 (0.311) df=6**
	35-44	11(28.2)	22(56.4)	6(15.4)	
	25-34	6(14.6)	27(65.9)	8(19.5)	
	15 -24	1(14.3)	6(85.7)	0(0)	
What is your highest educational level?					
2	No formal education	2(50)	2(50)	0(0)	**15.663 (0.016)* df=6**
	Tertiary education	4(9.3)	29(67.4)	10(23.3)	
	Secondary education	12(33.3)	20(55.6)	4(11.1)	
	Primary education	1(7.7)	12(92.3)	0(0)	
What is your Marital Status?					
3	Widowed	2(50)	2(50)	0(0)	**8.246 (-0.221) df=6**
	Separated/ Divorced	2(12.5)	14(87.5)	0(0)	
	Married	9(19.1)	28(59.6)	10(21.3)	
	Single	6(20.7)	19(65.5)	4(13.8)	
What is your Occupation?					
4	Businesswoman	1(4.5)	19(86.4)	2(9.1)	**18.125 (0.006)* df=6**
	Unemployed	8(38.1)	13(61.9)	0(0)	
	Self-employed	4(20)	14(70)	2(10)	
	Civil servant	6(18.2)	17(51.5)	10(30.3)	
What is your Religion?					

5	Traditional religion	1(100)	0(0)	0(0)	**5.123 (-0.275) df=4**
	Christianity	18(19.4)	61(65.6)	14(15.1)	
	Islam	0(0)	2(100)	0(0)	

* Statistically Significant

Table 6: Socio-Demographic Determinants of Attitude towards PMTCT Services.

Socio-demographic factors that had a significant association with attitude towards PMTCT services were level of education of respondents (χ^2 = 15.663, p=0.016) and occupation of respondents (χ^2 = 18.125, p=0.006). Age (p = 0.311), marital status (p = 0.221) and religion (p = 0.275) had no statistically significant association with attitude (Table 7).

S/N	Variables	Have You Received Any PMTCT Service Before? (n = 96)			χ2 / p-Value
		No (%)	Yes (%)	Maybe (%)	
What is your age range?					
1	45 and older	5(55.6)	4(44.4)	0(0)	**22.455 (0.001)* df=6**
	35-44	6(15.4)	25(64.1)	8(20.5)	
	25-34	19(46.3)	22(53.7)	0(0)	
	15 -24	5(71.4)	2(28.6)	0(0)	
What is your highest educational level?					
2	No formal education	0(0)	2(50)	2(50)	**18.142 (0.006)* df=6**
	Tertiary education	21(48.8)	20(46.5)	2(4.7)	
	Secondary education	13(36.1)	21(58.3)	2(5.6)	
	Primary education	1(7.7)	10(76.9)	2(15.4)	
What is your Marital Status?					
3	Widowed	0(0)	2(50)	2(50)	**37.126 (0.000)* df=6**
	Separated/ Divorced	7(43.8)	5(31.3)	4(25)	
	Married	9(19.1)	36(76.6)	2(4.3)	
	Single	19(65.5)	10(34.5)	0(0)	
What is your Occupation?					
4	Businesswoman	8(36.4)	12(54.5)	2(9.1)	**10.885 (-0.092) df=6**
	Unemployed	5(23.8)	12(57.1)	4(19)	
	Self-employed	5(25)	15(75)	0(0)	
	Civil servant	17(51.5)	14(42.4)	2(6.1)	
What is your Religion?					
5	Traditional religion	0(0)	1(100)	0(0)	**2.512 (-0.642) df=4**
	Christianity	35(37.6)	50(53.8)	8(8.6)	
	Islam	0(0)	2(100)	0(0)	

* Statistically Significant

Table 7: Socio-Demographic Determinants of Utilization of Prevention of Mother-to-Child Transmission Services.

Participants within the age band of 35-44(64.1%), those with tertiary education (46.5%), those married (76.6%), the self-employed participants (75%) and civil servants (51.5%), showed higher rates of PMTCT services utilization. However, the Socio-demographic factors that had a significant association with utilization of PMTCT services were age (χ^2 = 22.455, p = 0.001), level of education (χ^2 = 18.142, p = 0.006) and marital status of respondents (χ^2 = 37.126, p = 0.000) (Table 8).

Have you received any PMTCT services before?				
Knowledge Level	**No (%)**	**Yes (%)**	**Maybe (%)**	**χ^2 / p-Value**
Good Knowledge	16(21.1)	52(68.4)	8(10.5)	**38.299 (0.000) * df=6**
Moderate Knowledge	11(100)	0(0)	0(0)	
Poor Knowledge	5(100)	0(0)	0(0)	
No Knowledge	3(75)	1(25)	0(0)	

* Statistically Significant

Table 8: Association between Knowledge of Prevention of Mother-to-Child Transmission (PMTCT) of HIV and Utilization of Prevention of Mother-to-Child Transmission Services.

Participants with good knowledge level were found to have utilized PMTCT services the most (68.4%). There was a significant association between knowledge of PMTCT and utilization of PMTCT services (p<0.05) (Table 9).

Variable	**Were You Satisfied with The PMTCT Service(s) You Have Received? (n = 96)**		**χ2/p-Value**
	No (%)	**Yes (%)**	
Knowledge Level			
Good Knowledge	18(23.7)	58(76.3)	**20.498 (0.000)* df=3**
Moderate Knowledge	7(63.6)	4(36.4)	
Poor Knowledge	5(100)	0(0)	
No Knowledge	3(75)	1(25)	

Table 9: Association Between Knowledge of Prevention of Mother-To-Child Transmission of HIV (PMTCT) and Satisfaction with PMTCT Service(s) Utilized.

Participants with good knowledge level were found to be most satisfied with the PMTCT services they utilized (76.3%). There was a significant association between knowledge of PMTCT and satisfaction with PMTCT service(s) utilized (p<0.05) (Table 10).

Variable	**Were You Satisfied with The PMTCT Service(s) You Have Received? (n = 96)**		**χ2/p-Value**
No (%)		**Yes (%)**	
Attitude Level			
Good	6(42.9)	8(57.1)	**7.357 (0.025) * df=2**
Fair	16(25.4)	47(74.6)	
Bad	11(57.9)	8(42.1)	

* Statistically Significant

Table 10: Association Between Attitude Towards Prevention of Mother-to-Child Transmission of HIV (PMTCT) Services and Satisfaction with PMTCT Service(s) Utilized.

Satisfaction level with the PMTCT services was highest in participants with fair attitude (74.6%) and followed by those with good attitude (57.1%). There was a significant association between attitude towards PMTCT services and

satisfaction with PMTCT service(s) utilized (p=0.025).

Discussion

Level of Knowledge of PMTCT among Pregnant and Postpartum HIV-Positive Woman Accessing Care in Nine Selected PMTCT-Approved Health Facilities

A total of 96 women participated in this study, and the mean age of participants was 34.76 years (**SD** ± 2.33) with most of them being within the 25 -34 years age bracket (42.7%), see Table 4.1. This is close to the mean age of 28.6 years (SD ± 5.4) obtained in a study on the knowledge, attitude, and practice of antenatal care attendees towards PMTCT in Gurage Zone, Ethiopia [26]. Most of the participants had Tertiary level of education (44.8%), which is higher than 9.8% obtained in a similar study in Taraba State [27].

There is a good level of awareness of PMTCT services among the participants (85.4%). This is slightly lower than 86% reported by Onalu CE, et al. [28] obtained in a study that investigated factors affecting utilization of PMTCT services in Anambra State. In North-central Nigeria, awareness of MTCT was rated at 62.5% [29]. Most (79.1%) of the respondents in this study had good knowledge of PMTCT services, higher than the 28.2% reported in North-central Nigeria, [29], 69.4% in Kaduna State [30], and 74.2% in Oyo State [31]. The later was a study which analyzed the perception and utilization of PMTCT services among Women Living with HIV (WLHIV) who were of reproductive age and attended the clinics in two secondary health centres in Oyo State. Also, in a similar study that assessed the traditional birth attendants' (TBAs) knowledge and practice of prevention of mother-to-child transmission (PMTCT) of HIV in Taraba State; the study found that 86% of TBAs had a good knowledge about HIV and PMTCT [27]. Age ($p<0.05$) and religion ($p<0.05$) were found to have statistically significant association with the level of knowledge of PMTCT, unlike in the study by Harrison NE, et al. [32] in Lagos, where age, religion, ethnicity, educational qualification, and employment status had no statistically significant influence on knowledge level of participants. Good knowledge level has direct influence on the attitude towards PMTCT, utilization of PMTCT services and effectiveness of the Programme [32,33].

Investing in health education of pregnant women during antenatal care (ANC) will improve the knowledge of PMTCT [34]. Correct and adequate knowledge of PMTCT will greatly help pregnant and postpartum women on ART to adhere and take necessary precautions in ensuring the success of the Programme [35]. In this study, those with 'moderate to 'good' knowledge of PMTCT were more satisfied with the PMTCT services received. However, there were expressions of misconceptions about breastfeeding and delivery modes, by some participants. This could be the result of poor health education and communication strategies by the healthcare providers or lack of education at all in some facilities.

Attitudes Towards PMTCT, Exploring Perceptions, Beliefs and Cultural Influences That May Impact Their Engagement with PMTCT Services

It was observed that most of the respondents had a fair attitude (65.6%) towards PMTCT services while only 19.8% had good attitudes towards PMTCT services. This is lower that 70.0% in Ghana [33], 85% reported by Danso RO, et al. [36], in their study on midwives' perceptions and attitudes towards PMTCT of HIV services in Ghana, and 72.2% in Ethiopia [26]. In this study, we found that the level of education of respondents ($p<0.05$) and occupation of respondents ($p=0.006$) have statistically significant association with attitude towards PMTCT. Level of education improves knowledge and awareness on any health programmes. So good knowledge of PMTCT has direct proportionate effect on the attitude of women towards PMTCT service utilization ($p=0.025$). 86.4% of participants in this study who were businesswomen, had fair attitude towards PMTCT, followed by the self-employed (70.0%) and then the unemployed women (61.9%). The civil servants had better attitudes, and this difference could be results of the impact of their social network, economic strength and perceive social status on their perspective of health. Occupation does have influence on resources available to any individual for health purposes, including the adoption of sound health-seeking behaviours [37]. Jobless people for instance would be more concerned about getting a job and making money to feed themselves, than pursuing the health and wellbeing of an unborn child. It is important to initiate targeted health promotion activities on PMTCT, to improve the attitude of the populace towards PMTCT. In this study, those with a 'fair' to 'good' attitude towards PMTCT were more satisfied with the PMTCT services received.

Pattern of Utilization of PMTCT Services Among Pregnant HIV-Positive Women in Nine Selected PMTCT Centres

In this study, PMTCT utilization was significantly influenced by age ($p = 0001$), educational status ($p = 0.006$) and marital status ($p < 0.05$). Reception of PMTCT services majorly took place after delivery (64.6%) and during pregnancy (59.4%). The PMTCT services uptake during pregnancy was higher than 42.9% reported by Saka A, et al. [31], but lower than 79.7% reported by Yakasai B, et al. [30]. A higher percent of participants took up PMTCT services after delivery. This calls for concern, as the essence of the PMTCT

Programme is to mitigate MTCT of HIV. Good knowledge of MTCT at various points (during pregnancy, Labour and delivery, and breastfeeding) are good predictors of HIV testing services [30], which was low at 33.3%. When asked to name the point where they received PMTCT service, 31.3% of the respondents answered, "I don't know." This could be due to poor counselling and PMTCT education activities by the health workers or the respondents could not remember due to their status of no education [29]. In any case, health education and promotion of PMTCT needs to be intensified and local languages used when necessary to properly inform non-literate clients about PMTCT services.

Again, uptake of HIV counselling and testing services for partners was 43.8%, which is consistent with 45.8% obtained in a study by Yeshaneh A, et al. [26]. Partner testing and counselling helps to gain the involvement of the husband in providing required encouragement and support for the wife who is undertaking the PMTCT journey [28]. However, this could be traceable to the fact that only 49% of the respondents were legally married and living with their husband at the time of the study. The remaining 51% of the respondents were either single, separated/divorced or widowed at the time of the study. This poses a substantial challenge to the health workers in ensuring partner notification, and HIV counselling and testing services to the partners.

Barriers and Facilitators to Accessing and Utilizing PMTCT Services

Antiretroviral Therapy (ART), Counselling on infant feeding options and PMTCT education, were the predominant services utilized by the respondents. Availability of PMTCT services, recommendations by healthcare provider, knowledge about the benefits of PMTCT and concerns about the risk of transmitting HIV to their child, were most common factors influencing respondents' decision to utilize PMTCT services [37]. 72.9% of the respondents agreed that the availability of PMTCT services influenced their decision to utilize the services. This is perhaps due to the geographical location (Enugu metropolitan setting) of the selected health facilities. Expanding access and availability of PMTCT services in rural areas will be a positive influence on the utilization of PMTCT services. In a study conducted by Onalu CE, et al. [28], to investigate the factors affecting the utilization of PMTCT services in Anambra State, distance between place of residence and PMTCT centre was found statistically significant ($p = 0.043$).

In this study, the challenges associated with accessing PMTCT services as indicated by most respondents were fear of stigmatization (58.3%), poor partner involvement in antenatal care (50%), poor knowledge of PMTCT among mothers (50%), inadequate trained health workers to carry out PMTCT (42.7%) and financial barriers (41.7%). In a study carried out in Uganda, 52.0% of the respondents reported that their main reason for not collecting ARV drugs was fear of their partner or husband [37]. The presence or lack of partner involvement has great impact on the utilization of PMTCT services by HIV positive women of childbearing age. Stigmatization of HIV positive women is still high and a serious barrier to PMTCT services uptake in Enugu State, compared to 20.51% of respondents in Uganda who believed stigma was a barrier to PMTCT services uptake [37]. Therefore, creating a stigma-free environment and encouraging spousal support is believed to have enhancing or facilitating effects on the utilization of PMTCT services as well as retention in HIV care [32].

In the end, most (87.8%) of the respondents were likely to utilize PMTCT in their next pregnancy. The same was noted in a study by Saka A, et al. [31] which identified challenges to the use of PMTCT services to be stigma (16.5%), discrimination (15.4%), financial constraint (11.5%), and non-involvement of partners (8.2%).

Giving that HIV is a public health burden and Nigeria ranks the second most affected country in West Africa (after South Africa), with Nigeria recording the highest pediatric HIV infection through mother-to-child transmission [4,38]; this study will be used to establish the existing information on the knowledge, attitude and utilization of PMTCT services by pregnant and postpartum women living with HIV.

Conclusion

Findings from this study, most of the women had fair attitude towards PMTCT services. There was a significantly good level of utilization of PMTCT services among pregnant and postpartum HIV-positive women across the nine selected PMTCT centres. The socio-demographic factors that were significantly associated with knowledge of PMTCT of HIV were age and religion of respondents. Level of education and occupation of respondents were the socio-demographic factors that had a significant association with attitude towards PMTCT services. The socio-demographic characteristics of the respondents that had a significant association with utilization of PMTCT services were level of education, age and marital status of respondents. A significant association was found between knowledge of PMTCT and utilization of PMTCT services. There was a significant association between knowledge of PMTCT and satisfaction with PMTCT service(s) utilized. There was a significant relationship between satisfaction with the PMTCT service(s) utilized and respondents' attitude towards PMTCT services.

Recommendations

The following recommendations were arrived at the end of this study:

1. The Government should enact regulations that support comprehensive care of infants born to women living with HIV and facilitate rapid linkage to optimized treatment.
2. Religious Leaders should be targeted for more education on the importance of PMTCT of HIV.
3. The researchers suggest that further research be carried out to 'Examine the Impact of Utilizing PMTCT Services on the reduction of pediatric HIV infections in Enugu Metropolis.

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Authors' Contributions

Conception (Akwolu CC), Study design (Akwolu CC, Aghedo OG), data collection (Akwolu CC), Data analysis (Akwolu AC, Aghedo OG), Drafting of the manuscript (Akwolu AC, Aghedo OG, Dike PN, Achime NE, Ozoemena CM, Ugwuezumba ON, Nwadinigwe UJ), Review and Editing of Manuscript (Akwolu CC, Aghedo OG, Dike PN, Achime NE, Ozoemena CM, Ugwuezumba ON, Nwadinigwe UJ). The final manuscript has been reviewed and approved by all co-authors.

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Competing Interests

The authors **do not have** any conflict of interest in this research.

Ethical Considerations

Ethical clearance was obtained from the Ethics Committee of Enugu State Ministry of Health (ethical approval reference number: MH/MSD/REC21/482), after scrutiny of the research proposal. Participation in the study was entirely voluntary and the respondents were given sufficient information about the study which enabled them to decide whether to take part or not. A written informed consent was obtained from all the participants. Confidentiality was maintained in accordance with standard practice (there was no provision for name, address and any other personal information). No harm in any form was caused to study subjects. The authors declare no conflict of interest in this study.

Data Availability Statement

All the survey data for this study have been analyzed and reported in the article, and there is no need to upload any data as online supplemental information.

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