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Research Article

Health Systems Barriers to the Implementation of Preventing Mother-to-Child Transmission of Human Immunodeficiency Virus Infection in Primary Health Care Facilities in Ghana

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Background. Ghana has implemented the prevention of mother-to-child transmission strategy (PMTCT) to control HIV infection transmission to babies. However, this has not yielded the desired results, as there are still many mother-to-child HIV infection cases being reported due to factors such as those related to health system barriers. This study was, therefore, conducted to identify health system barriers to the implementation of PMTCT in selected districts in the Ashanti Region of Ghana. *Methods*. A cross-sectional study was conducted among 118 health workers in 20 selected health facilities within the Asante-Akim Central and South Municipalities in the Ashanti Region, Ghana, to assess the health system barriers to the prevention of mother-to-child transmission of HIV/AIDS. Data was collected using a structured, self-administered questionnaire, which was later transferred to Kobo Collect software. The study participants were chosen using multistage sampling approaches. The data cleaning and analysis were done using STATA version 16.1. Multiple logistic regression models, chi-square analysis for normality testing, and descriptive analysis were all used. The results were displayed in tables, and a p-value of 0.05 was used to determine the significance level. The study was carried out from June to September 2022. *Results*. In all, 118 participants were involved in this study. Of this, 57.4% had a good level of knowledge of PMTCT, even though all of them were aware of PMTCT. We found being more than 40 years (Odds Ratio, OR = 2.08 95% CI: 1.05, 5.00) and being in service with Ghana Health Service for more than 15 years (OR = 2.36 95% CI: 0.51,10.84) to be significant predictors of knowledge on PMTCT among our participants. A greater proportion of our participants revealed inadequate staffing as the major challenge faced in the delivery of PMTCT in Ashanti Region. Increased education on PMTCT was the most suggested solution to improve the management of HIV infection among pregnant women and further enhance the success rates of PMTCT in Ashanti Region, Ghana. *Conclusions*. The majority of the health professionals had good knowledge about the prevention of mother-to-child transmission. However, the number of staff in the two districts was not adequate, which affected public education. It is therefore important to increase the number of staff to enhance educating the public and minimize the transmission rate in the districts and the country as well.

1. Introduction

The human immunodeficiency virus (HIV) infection remains a major public health challenge globally (Reyes-Terán, Patogénesis de la infección por el virus de la inmunodeficiencia humana (Pathogenesis of human immunodeficiency virus infection). Revista de investigacion clinica; organo del Hospital de Enfermedades de la Nutricion, 1994) [1, 2]. In 2019, ~38-million people lived with Acquired Immunodeficiency Syndrome (AIDS) globally, of which 1.8 million were reported to be minors below 15 years [3]. There were also an estimated 37.7 million individuals living with HIV in 2020, of whom 36 million were adults and 1.7 million were children aged 0 to 14 [2, 4]. More than 90% of children who contract HIV infection through mother-to-child transmission (MTCT) in Sub-Saharan Africa [4, 5]. According to 2018 national estimates, the prevalence of HIV infection in adults was 1.69% in Ghana. The total number of HIV/AIDS-positive individuals

was projected to be 334,713, with 29,514 (8.8%) of these being children aged 0–14. Out of the 19,931 new HIV infections, there were 3,317 children; the predicted number of AIDS-related deaths was 14,181, with 2,769 being children under 15 years old [6].

Mother-to-child transmission is when an HIV-positive pregnant woman passes the virus on to her child at any stage of the pregnancy, in the utero, during delivery, and/or during breastfeeding. This is also known as "vertical transmission" and may occur if appropriate interventions are not put in place [7] (AFRICA, 2021). Although a variety of factors may influence access to prevention of mother-to-child transmission (PMTCT) services, health system capacity to satisfy demand is vital and may serve as a major predictor of uptake, adherence, and retention [8]. In order to provide adequate care, it is necessary to have adequate human resource capacities, infrastructure, and equipment, as well as supplies [9]. In order to provide the services, healthcare institutions need to be well-resourced, with staff that is knowledgeable and motivated. It has become a challenge for health systems to meet the growing need for comprehensive and long-term care for HIV-infected women [10].

The PMTCT is offered to mothers and their children in an effort to reduce the risk of HIV infection transmission from the mother to the child, enhance early detection, provide early treatment, and by all means protect children from getting infected by HIV [11].

Over the years, Ghana has achieved great progress in combating the HIV infection epidemic, as the prevalence of HIV in pregnant women is steadily decreasing. The National Health Sentinel Survey for 2019 reported HIV prevalence among prenatal clients at 2.0%, a 0.4% decrease from 2018. The survey, which took place in 40 selected antenatal clinics in the country, recorded HIV prevalence among pregnant women between 0.4% and 4.2% in some rural and urban areas ("2019 HIV Sentinel Survey Report", 2019). In September 2005, Ghana pledged to carry out the objectives set forth in the United Nations General Assembly Special Session (UNGASS) on HIV/AIDS at a United Nations conference hosted by the World Health Organization. The goal was to eliminate vertical transmission of HIV, leading to a generation free of HIV/AIDS [12]. As a result, Ghana has adopted global initiatives aimed at preventing HIV infections among children with help from development partners to strengthen the provision of PMTCT services [13].

The purpose of PMTCT is to lower HIV MTCT to such a low level that it is no longer a public health issue. Ghana has provided a comprehensive guideline for PMTCT, following the WHO recommendations. Despite all these efforts, a substantial number of cases of mother-to-child transmission are recorded, which makes it difficult to achieve the targets by 2030, as spelled out in Sustainable Development Goals (SDGs) 3. Hence, there is a need to conduct a study to assess the health system barriers preventing MTCT in the country and use the evidence to inform policies and practices that contribute further to the prevention of mother-to-child transmission of HIV infection in Ghana.

2. Materials and Methods

We conducted a cross-sectional study among various categories of health workers from June to September 2022. The study was conducted to assess the level of knowledge of health workers on the prevention of MTCT and to ascertain whether it enhances or serves as a health system barrier to the prevention of MTCT.

A multi-stage sampling method was used in selecting health workers and health facilities within the Asante-Akim Central and South Municipalities in the Ashanti Region.

2.1. Sampling. A multi-stage sampling method was employed in this study. There are 34 health facilities in the two districts: 18 in the Asante Akim South District and 16 in the Asante Akim Central District. The various health facilities within the districts were grouped into public hospitals, private hospitals, health centers, and Community-Based Health and Planning Services (CHPS).

The sampling approach considered all the health facilities that provide PMTCT services in selected districts. Three (3) health centers and four (4) CHPS were selected randomly from each district. In all, 2 public hospitals, 2 private hospitals, 6 health centers, and 8 CHPs across the two districts were selected. Since Asante-Akim South has a large number of CHP facilities compared to Asante Akim Central, two CHPs were included, making a total of 20 facilities. This allowed for all health workers within the districts to be fairly represented. A random sampling method was used to select participants from the various categories of health workers working in health facilities that were providing PMTCT services in the two districts.

Only key informants of PMTCT in HIV-providing healthcare facilities (health workers in the ART unit and maternity) who gave their consent to participate in the study were included. All other staff not involved with pregnant women or the ART clinic and health staff who were eligible but did not consent to the study were exempted.

2.2. Sample Size Estimation. The estimated sample size has an assumed prevalence of 15% of the knowledge of health workers using a 95% confidence interval, which corresponds to a 1.96 Z value, a precision error of 0.05, and a 5% nonresponse rate.

The sample size for this study was determined by adopting formula to determine the minimum sample size for this study, as represented in the following:

$$n = \frac{N}{1 + N(\infty)^2}, \tag{1}$$

where: n = sample size, N = study population, α = margin of error which is 0.05 with significance level of 95%. Total number of health workers (N) = 156.

Thus, the sample size for the study was calculated as following:

$$n = 156/1 + 156(0.05)^2, \tag{2}$$

$$n = 156/1 + 156(0.0025), \quad (3)$$

$$n = 156/1 + 0.39, \quad (4)$$

$$n = 156/1.39, \quad (5)$$

$$n = 112. \quad (6)$$

Adding a nonresponse rate of 5%, we will get the following:

$$n = (112 \times 0.05) + 112 = 118, \quad (7)$$

2.3. Data Collection Tools and Techniques. A standardized questionnaire was employed using Kobo Collect to collect data from the participants. Kobo Collect is used for managing online health surveys; it is installed on smart phones and secure; and it allows for capturing data offline as well. The questionnaire comprised of both open-ended and closed-ended questions. The questions were given to all participants. The persons responsible for collecting data were the principal investigator and two research assistants. The research assistants were trained prior to their participation in the data collection. The training equipped them with the requisite skills and knowledge for the collection of quality data. Privacy and confidentiality were adhered to in all stages of the study.

The questionnaire was developed with questions relevant to the study objectives. They were categorized into sociodemographic characteristics, health workers knowledge of the PMTCT program, and challenges faced in the implementation of the program. A facility checklist was developed to assess equipment and supplies. A gap analysis document specifically on human resources was derived from the district health directorate to determine the human resource capacity of the facilities.

2.4. Data Analysis and Presentation. The collected data, which were in Excel format, were exported to Stata 16.0 for data analysis. Categorical data were summarized using frequencies and percentages; normally distributed continuous data were summarized using mean and standard deviation; and discrete data, as well as skewed continuous data, were summarized using the median and inter-quartile range. The results of the study were represented using tables.

2.5. Ethical Consideration (CHRPE/AP/055/22). Permission was obtained from the selected district health directorates before applying for ethical approval. Ethical clearance was sought and obtained from the Committee on Human Research, Publication, and Ethics of Kwame Nkrumah University of Science and Technology (CHRPE/AP/055/22) for the purpose of the study. Participants were given the autonomy to decide to take part in the research. No participant was forced to provide any information under any circumstances. Facilities were given a special identification code to ensure that the information collected for the study is anonymous and cannot be traced to any health facility or health worker.

3. Results

In all, a total of 122 health workers (HW) took part in this study. Out of this, 45.9% were between the ages of 30–39 years. The majority (68.7%) of these HW worked in hospital settings, while 5.7% worked in various CHPS. Also, more than a third-quarter (87.7%) of our study participants were in the public sector. 41.8% of our study participants were nurse/midwives, with less than 5% of them being senior community health nurses/midwives. For academic qualifications, almost a third-quarter had a diploma as their highest educational qualification, with 5% having a post-graduate education. The majority (47.5%) of our study have worked with GHS for less than 5 years (Table 1).

3.1. Health Workers' Knowledge of the PMTCT Program. All the participants in our study were aware of the existence of PMTCT. However, the overall knowledge of PMTCT among our participants was 57.4%. For knowledge on WHO/UNICEF's pillars of PMTCT, 37.9% of our study participants knew prevention of HIV transmission from positive mothers to their infants was one of the key pillars of WHO and UNICEF PMTCT strategies. A high proportion (82.7%) of our study participants knew HIV rapid testing is performed for pregnant women as part of the PMTCT services package. Similarly, 86.9% of our participants knew that HIV can be transmitted from the mother to their baby. More than half (59.0%) of our study participants reported delivery as the highest mode of transmission of HIV from the mother to the child. Less than 10% of our participants revealed that an HIV-positive mother is bound to have an HIV-positive baby. A vast majority (93.4%) of our participants indicated that it was relevant to use gloves when handling all body fluids during service delivery. More than half (68.0%) of our study participants disagreed that an infected person may test negative for HIV/AIDS. Further, obstetric procedures were reported by the majority of the health workers (33.2%) as a factor that increases the risk of HIV transmission from mother to baby, as shown in Table 2.

3.2. Training of Health Workers on PMTCT. More than a third-quarter (82.0%) of our study participants have received training on PMTCT. In addition, 10% were trained on voluntary counseling testing, and 15.4% received training on antiretroviral therapy (ART). Also, 25% received training on a quarterly basis. 94% of those who have received training revealed it to be beneficial, and 91% of these also indicated that it has positively influenced their practice in the various health facilities, as indicated in Table 3.

3.3. Human Resource. In all, a total of 10 health facilities were included in the study, where PMTC services were provided by the various health workers who were readily available, as shown in Table 4.

3.4. Infrastructure and Logistics. Out of the 10 health facilities included in the study, 50% had counseling rooms and inpatient wards. All health facilities had labor and delivery rooms. The majority (80%) of these facilities do not have rooms for surgery. For logistics, all the facilities had antiseptics, delivery kits, scissors, gloves, and sterilizing gauze at the time of this study. Also, 70% of the facilities had ARV tablets at the time of the conduct of this study, as shown in Table 5.

Table 1: Sociodemographic characteristics of HWs.

Variable	Frequency ($N = 122$)	Percentage (%)
Age (years)		
<29	50	41.0
30–39	56	45.9
>40	16	13.1
Median age (IQR)	32 (28–36)	
Type of facility		
Clinic/Health Center	19	15.6
Community-based Health Planning and Service (CHPS)	7	5.7
Hospital	96	78.7
Work environment		
Private	15	12.3
Public	107	87.7
Rank		
Community health nurses/midwives	11	9.0
Nursing/midwifery officers	3	2.5
Senior nursing/midwifery officers	6	5.0
Senior community health nurses/midwives	3	2.5
Senior staff nurses/midwives	23	18.9
Staff nurse/midwives	51	41.8
Others	25	20.5
Academic qualification		
Certificate	17	14.0
Diploma	89	72.4
Postgraduate	6	5.0
Others	10	14.0
Working department		
Antenatal care (ANC)	44	36.1
Family planning	15	12.0
Labor room	35	28.7
Post-natal	10	8.2
Others	18	14.8
Years worked with GHS		
<5 years	58	47.5
5–10 years	34	27.9
11–15 years	22	18.0
>15 years	8	6.6
Years worked in this facility		
<5 years	85	70.0
5–10 years	27	22.1
11–15 years	5	4.0
>15 years	5	4.0

4. Discussions

This study was carried out to assess the knowledge of health workers on the MCT as a health system barrier to the management of the prevention of mother-to-child HIV.

The study highlighted barriers such as a shortage of health workers and a lack of training as major challenges experienced by most health workers in the district. The finding was consistent with another study conducted by Nuwagaba-Biribonwoha et al. [14] in Uganda, which also found that among the other challenges faced by health workers in the implementation of the PMTCT program, shortages in staff providing health care in the PMTCT program were the major challenge. This does not come as a surprise, as the deficit in health professionals has been a global concern over the years. In some cases, the available HWs do not have the required skills to deliver PMTCT services, hence the similarities in the findings of these studies.

Table 2: Health workers' knowledge of the PMTCT program.

Variable	Frequency ($n = 122$)	Percentage (%)
Awareness of PMTCT		
Yes	122	100
No	0	0
WHO and UNICEF pillars of the PMTCT		
Primary prevention of HIV among women of reproductive age	42	17.7
Prevention of unintended pregnancies among women living with HIV	56	23.5
Prevention of HIV transmission from a woman living with HIV to her infant	90	37.8
Provision of appropriate treatment, care and support to women living with HIV and their children and families	50	21.0
Test for pregnant women for PMTCT services		
ELISA (enzyme-linked immunosorbent assay)	13	9.42
HIV rapid test	114	82.7
WB (western blot) test	3	2.2
Others	8	5.8
HIV transmissible from mother to her child		
Yes	106	86.9
No	16	13.1
Mode of transmission		
Utero	48	16.9
Labor	39	13.6
Delivery	104	36.3
Breastfeeding	84	29.4
Others	11	3.9
Mode of highest rate of transmission		
Utero	7	5.7
Labor	5	4.1
Delivery	72	59.0
Breastfeeding	32	26.2
Don't know	6	4.9
All HIV positive mothers will deliver HIV positive babies		
Yes	9	7.4
No	113	92.6
Gloves necessary for handling body fluids		
Yes	8	6.6
No	114	93.4
Infected person may test negative for HIV/AIDS		
Yes	39	32.0
No	83	68.0
Factors increasing mother-to-child transmission via breastfeeding		
Recent infection with HIV	7	3.5
Severity of HIV infection	31	15.6
Obstetric procedures	66	33.2
Duration of breastfeeding	36	18.1
Exclusive breastfeeding	4	2.0
Mixed feeding	50	25.1
Others	5	2.5
Methods to reduce mother-to-child transmission		
Abstain from sex	9	4.2
Healthy eating	44	20.7
Seek antenatal care	48	22.5
The use of condoms	11	5.2
Take medicines	99	46.5
Others	2	0.9

Table 3: Training of health workers on PMTCT.

Variable	Frequency ($N = 122$)	Percentage
Training on PMTCT		
Yes	100	82.0
No	22	18.0
Content of training ($N = 100$)		
VCT (voluntary counseling testing)	26	10.0
STI (sexually transmitted infections)	44	16.9
PMTCT (prevention of mother to child transmission)	71	27.3
ART	40	15.4
Counseling	69	26.5
Confidentiality	5	1.9
Others	5	1.9
Frequency of HIV/AIDS training ($N = 100$)		
Monthly	34	34.0
Quarterly	25	25.0
Twice a year	17	17.0
Yearly	24	24.0
Training beneficial ($N = 100$)		
Yes	94	94.0
No	6	6.0
Training positively influence practice ($N = 100$)		
Yes	91	91.0
No	9	9.0
Need for PMTCT services training ($N = 100$)		
Yes	94	94.0
No	6	6.0
Need for tailored training on PMTCT		
Yes	31	31.0
No	69	69.0
Specific area for training ($N = 31$)		
ART	11	35.5
PMTCT counseling	16	51.6
Voluntary counseling testing	4	12.9
Existence of national guidelines on PMTCT		
Yes	76	62.3
No	46	37.7
Availability of national guideline for PMTCT in facility		
Yes	51	41.8
No	71	58.2
Availability of PMTCT communication channel in facility		
Yes	17	86.1
No	105	13.9
Communication channel ($N = 17$)		
Counseling -ART	2	11.8
Having a meeting to know more about PMTCT	3	17.7
Those who attend training update us	4	23.5
Through training	6	35.3
To take sample for EID	2	11.8

Table 4: Human resource.

Variable	Frequency ($n = 10$)	Percentage (%)
Type of facility		
Community -Based Health Planning (CHPS)	4	40.0
District hospital	1	10.0
Health center	5	50.0
Geographical location		
Peri urban	3	30.0
Rural	7	70.0
Services provided		
Laboratory services	2	20.0
Maternity services	5	50.0
Others	3	30.0
Ownership of facility		
Public	10	100
Average number of pregnant patients per day		
<5	4	40.0
>5	6	60.0

Table 5: Infrastructure and logistics.

Variable	Frequency ($n = 10$)	Percentage (%)
Counseling (confidentiality) facilities		
Yes	5	50.0
No	5	50.0
Inpatients wards		
Yes	5	50.0
No	5	50.0
Records keeping material		
Yes	9	90.0
No	1	10.0
Labor and delivery		
Yes	10	100
Operating room (surgery)		
Yes	2	20.0
No	8	80.0
Testing room		
Yes	5	50.0
No	5	50.0
Gloves		
Yes	10	100
Sharp box		
Yes	10	100
Disposable needles and syringe		
Yes	10	100
Hand washing items		
Yes	10	100
ARV tablets		
Yes	7	70.0
No	3	30.0
ARV sirup		
Yes	5	50.0
No	5	50.0

Table 5: Continued.

Variable	Frequency ($n = 10$)	Percentage (%)
HIV RDT kits		
Yes	10	100
IEC materials		
Yes	7	70.0
No	3	30.0
Condoms		
Yes	9	90.0
No	1	10.0
Protective clothing		
Yes	9	90.0
No	1	10.0
Sterilizing equipment		
Yes	9	90.0
No	1	10.0
Delivery kits		
Yes	10	100
Sterilize gauze		
Yes	10	100
Scissors		
Yes	10	100
Antiseptic		
Yes	10	100

Furthermore, findings from this study showed that inadequate logistics, a lack of motivation, and inadequate training were some of the challenges faced by health workers in the implementation of the PMTCT program. Our results resonate with the findings of Nguyen et al. [15] in Vietnam, which also found a shortage of staff, limited knowledge, and the unavailability of logistics, especially antiretroviral drugs, as some of the factors that led to health workers' failure to provide good quality services in the implementation of the PMTCT program. These reflections may be attributed to the disproportionality of health workers to patient ratio and the inadequate resources in low- and middle-income countries. This study highlighted the need to employ more health workers and also to strengthen PMTCT services through the provision of the necessary logistics and staff motivation for health workers in the PMTCT program to ensure the smooth running of the program.

The study also found that the number of years of practice in GHS significantly influenced the knowledge of health workers on PMTCT. Participants who have been in service with the GHS had a higher odds of having good knowledge on PMTCT. Also, the age of the participant was found to be statistically significant to the knowledge of the participants on PMTCT. On the contrary, Arisegi et al. [16–20] found no significant relationship between knowledge of PMTCT and years of practice of health workers, as well as the age of participants in their study. This could be attributed to the variations in sample size and sampling procedures employed in these two studies.

5. Conclusions

This study showed that the successful implementation of PMTCT is inhibited by insufficient health workers in the various health facilities and poor environmental conditions. It is worth noting that most of the facilities had relevant logistics and infrastructure to carry out PMTCT services. However, there is a need to improve the environment and workforce to ensure successful implementation of the PMTCT policy in the two districts and the country at large.

Data Availability

The data used to support the findings of this study are included within the article.

Additional Points

Limitation of the Study. The strength of our study is that it offers insight into the level of knowledge of health workers at the primary healthcare level on PMTCT and the need to improve on it to reduce transmission of HIV from mother to child. Also, it used a multistage sampling method in the selection of participants, which makes the results more representative. The limitation, on the other hand, is that in interpreting the results presented in this article, there is a potential for recall or memory bias as the data are obtained from a cross-sectional study design. However, we asked follow-up questions to enhance recalls.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

References

[1] J. A. Levy, "Pathogenesis of human immunodeficiency virus infection," *Microbiological Reviews*, vol. 57, no. 1, pp. 113–289, 1993.

[2] WHO, "HIV and AIDS," 2021, https://www.who.int/news-room/fact-sheets/detail/hiv-aids.

[3] D. L. Fay, "Global HIV/AIDS overview," *Angewandte Chemie International Edition*, vol. 6, no. 11, pp. 951–95, 2020.

[4] UNAIDS, *Global Hiv Statistics Ending the AIDS Epidemic*, KFF Publisher, 2015.

[5] J. B. Ladner, M.-H. Besson, M. Rodrigues, K. Sams, E. Audureau, and J. Saba, "Prevention of mother-to-child HIV transmission in resource-limited settings: assessment of 99 viramune donation programmes in 34 countries, 2000–2011," *BMC Public Health*, vol. 13, no. 1, pp. 1–8, 2013.

[6] UNAIDS, "Country progress report on 90-90-90 Ghana," pp. 1–42, 2019, https://www.unaids.org/sites/default/files/country/documents/GHA_2019_countryreport.pdf.

[7] Avert.org, "Children, HIV and AIDS | Avert," 2020, https://www.avert.org/professionals/hiv-social-issues/key-affected-populations/children.

[8] A. Gourlay, I. Birdthistle, G. Mburu, K. Iorpenda, and A. Wringe, "Barriers and facilitating factors to the uptake of antiretroviral drugs for prevention of mother-to-child transmission of HIV in sub-Saharan Africa: a systematic review," *Journal of the International AIDS Society*, vol. 16, no. 1, 2013.

[9] T. A. Nguyen, P. Oosterhoff, Y. N. Pham, A. Hardon, and P. Wright, "Human Resources for Health Health workers views on quality of prevention of mother-to-child transmission and postnatal care for HIV-infected women and their children," *Human Resources for Health*, vol. 7, no. 1, Article ID 39, 2009.

[10] C. N. Mnyani and J. McIntyre, "Challenges to delivering quality care in a prevention of mother-to-child transmission of HIV programme in Soweto," *Southern African Journal of HIV Medicine*, vol. 14, no. 2, pp. 64–69, 2013.

[11] RPJMD, "No world health statistics, monitoring health for the SDGs," 2021.

[12] WHO, "Towards the elimination of mother-to-child transmission of HIV," November 2010.

[13] GAC, "Ghana AIDS Commission," pp. 1–31, 2017.

[14] H. Nuwagaba-Biribonwoha, R. T. Mayon-White, P. Okong, and L. M. Carpenter, "Challenges faced by health workers in implementing the prevention of mother-to-child HIV transmission (PMTCT) programme in Uganda," *Journal of Public Health*, vol. 29, no. 3, pp. 269–274, 2007.

[15] T. A. Nguyen, P. Oosterhoff, Y. N. Pham, A. Hardon, and P. Wright, "Health workers views on quality of prevention of mother-to-child transmission and postnatal care for HIV-infected women and their children," *Human Resources for Health*, vol. 7, no. 1, pp. 1–11, 2009.

[16] S. Arisegi, K. Awosan, H. Abdulsamad, H. Adamu, M. Isah, and S. Mora, "Knowledge and practices regarding prevention of mother-to-child transmission of HIV among Health workers in primary healthcare centers in Sokoto, Nigeria," *International STD Research & Reviews*, vol. 6, no. 3, pp. 1–9, 2017.

[17] L. Thomas, "Cross sectional," 2020, https://www.scribbr.com/methodology/cross-sectional-study/.

[18] National AIDS/STI Control Programme (NACP) and Ghana Health Service, "National guidelines or preventi on of mother to child transmission of HIV," 2011.

[19] G. Statistics, "Global HIV targets," pp. 1–12, 2016.

[20] A. Who, N. Hiv, and Programmes, FORN, "Adapting Who Normative HIV Guidelines Essential Principles and Processes," World Health Organization, 2011.