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Prevention of mother to child transmission of Human Immunodeficiency virus (HIV): What do Ghanaian Midwives know?

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ABSTRACT

Background: Prevention of Mother to Child Transmission (PMTCT) is an important public health intervention that has significantly reduced the risk of mother-to-child transmission of Human Immunodeficiency Virus (HIV) from 40% to close to 5%. Midwives need to have good knowledge of this important preventive strategy to be able to contribute to global efforts aimed at the elimination childhood HIV infections and all other forms of HIV infection.

Methods: This research employed an analytical cross-sectional study design and recruited 179 Midwives through purposive sampling. A self-administered questionnaire was completed by participants to test their knowledge regarding PMTCT for HIV. Analysis of data was done through STATA using ANOVA, binary logistic regression analysis with a level of significance set at < 0.05.

Findings: The knowledge levels observed in this study include High (48%), moderate (35.2%), and Low (16.8%) with an overall mean score of 67.82 indicating a moderate level of knowledge among the studied sample. Having a master's degree (aOR = 1.3; 95 % CI = 0.1–0.9). and age (aOR = 14.9; 95 % CI = 0.6–0.9) were factors that showed statistically significant association with having good knowledge of the guidelines.

Conclusions: Even though most of the participants were within the level of high knowledge of the guidelines, overall knowledge at among the studied sample was level moderate. Knowledge improved with increasing age. Midwives with master's degree demonstrated good knowledge of the guidelines. Support in the form of training is needed to achieve optimum knowledge of the PMTCT guidelines among midwives who are the main implementers of the PMTCT strategy in Ghana.

1. Introduction

According to the World Health Organization, Human Immunodeficiency Virus (HIV), continues to be a major global public health issue and has so far claimed 40.1 million lives globally. In the year 2021 alone, over 650 000 people died from HIV-related causes, and 1.5 million people newly acquired the virus (Joint United Nations Programme on HIV/AIDS, 2021). In sub-Saharan Africa, women and girls accounted for 63% of all new HIV infections in 2021 (Joint United Nations Programme on HIV/AIDS, 2021). HIV infection impacts the lives of young girls and women globally as these individuals are more socially and biologically susceptible to HIV acquisition (Gray & McIntyre, 2006).

One of the commonest modes of sustaining the transmission of HIV in women and young girls is vertical transmission also known as Mother-to-Child-Transmission (MTCT) of HIV. With this mode of transmission, HIV-infected women pass the virus to their newborns during pregnancy, labour, and delivery as well as the period of breastfeeding (Mutabazi et al., 2017). In the absence of medical intervention, an HIV-infected woman has more than a 30% chance of passing the virus onto her baby during pregnancy, labour, and delivery. In addition, about 5% to 20% of new-borns would become infected through breastfeeding (De Cock et al., 2000).

It has been established that MTCT is the most common mode of transmission of HIV to children. Over 90% of children with HIV acquired the infection through MTCT (Mutabazi et al., 2017). The Prevention of Mother to Child Transmission (PMTCT) of HIV is a public health and medical intervention being pursued at the global level to prevent pediatric HIV/AIDS and better health of both mothers and their children

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(World Health Organization, 2010b). This intervention has resulted in a significant reduction in the risk of MTCT from nearly 40% to close to 5% (World Health Organization, 2010a). Based on this level of success, PMTCT is considered an important gateway for HIV prevention, treatment, and care support for affected individuals and their families (Joint United Nations Programme on HIV/AIDS, 2021). The components of the PMTCT program require that every pregnant woman is offered an HIV test and the woman accepts the results and post-test counseling. The recommendations further mandate an HIV-positive pregnant woman to undergo CD4 assessment and receive Anti-Retroviral Therapy (ART) for viral suppression among many others (World Health Organization, 2010b).

The focus of PMTCT is applied in three important phases based on the period of transmission namely, pregnancy, labour, and breastfeeding. These three phases underscore or reemphasize the critical roles of midwives in preventing MTCT of HIV and subsequent pediatric HIV infections (Meilani et al., 2019).

Midwives are the major providers of PMTCT services in many low-income settings including Ghana. Their primary roles and responsibilities extend from HIV testing and diagnosis, prescription of ART, ensuring safe delivery, counselling on infant feeding, and management of opportunistic infections among many others (Zachariah et al., 2009). Midwives have relied largely on available protocols, recommendations, and guidelines on PMTCT to guide their practice. These documents have seen several revisions over time with the emergence of powerful empirical evidence now providing the basis for practice.

In Ghana, the successful development and dissemination of the PMTCT guidelines have resulted in the training of midwives and other service providers to achieve full and effective integration of PMTCT services into maternal and reproductive health and general health care delivery. The guidelines have been in existence for close to a decade and with the sharp rise in HIV/AIDS national median prevalence rate from 2015 onwards (Ghana AIDS Commission, 2016) there is a need to re-evaluate the knowledge of midwives who are the main implementers of the PMTCT strategy. There is no data available to show that midwives in the study setting committed errors while providing care for pregnant women infected with HIV because of poor knowledge of the PMTCT guidelines. However, the rapid reduction in the frequency of training in the area of HIV/AIDS and reproductive health in general as a result of many external donor partners pulling out their support warrants a re-evaluation of the level of knowledge of service providers. Also, a study in Ghana that assessed challenges to PMTCT service delivery found that PMTCT service providers identified inadequate in-service training as a key reason for their outdated knowledge (Laar et al., 2014). This present study, therefore, assessed the knowledge levels and associated factors among midwives in one of the Christian Health Association of Ghana facilities in the Ashanti Region of Ghana.

2. Methods

2.1. Design

The study adopted a hospital-based analytical cross-sectional design to assess the level of knowledge of midwives on PMTCT guidelines

2.2. Study Setting

The study was conducted in one of the secondary-level institutions under the Christian Health Association of Ghana which is located in the Asante Akim Agogo District of the Ashanti Region. It is the biggest secondary hospital in the region. The hospital is a training institution for Pharmacy interns, House Officers, Nurses, Midwife trainees, etc. The hospital is a Malaria Vaccine Trial and Buruli Ulcer training site. The hospital serves an average population of 81,419 but also serves as a referral facility for many lower-level and primary care facilities in the Ashanti region and beyond. The hospital has a bed capacity of 250 with 10 wards and two operating theatres. It has over 700 professional staff including doctors, nurses' midwives, and other paramedical staff. Outpatient department capacity for the year 2021 was 127,492. The facility has over 20 units and departments with HIV/PMTCT care and services adequately integrated into maternal and child health services as well as general healthcare delivery. The number of HIV-negative newborns to mothers who were infected with HIV was 65 in 2019.

2.3. Target Population

Participants were midwives who were actively practising at a Christian Health Association of Ghana (CHAG) health facility in the Ashanti Region of Ghana. These individuals were chosen for this research because they provide maternal health care including PMTCT services to women who are pregnant.

2.4. Inclusion and exclusion criteria

The study was limited to qualified midwives with over two years of professional experience who were on duty during the period of data collection and gave consent to voluntarily participate in the study. Midwives who have received training in the management of HIV and other bloodborne diseases in the past year were excluded from the study. This is because, PMTCT documents or guidelines have seen several revisions over time with the emergence of powerful empirical evidence now providing the basis for practice. Midwives who attended training in the past year are likely to have received information in current issues in PMTCT care and hence their exclusion from the study.

2.5. Sample size and sampling A

Sample size of 170 was deemed adequate for the study. This was obtained by using yamane's (1967) formula as indicated below

$n = \frac{N}{1+N(e)}2$ where: n = minimum sample size estimated for the study, N = total population of midwives at the CHAG facility which is 297 e = marginal error of 0.05. Adjusting for a 5% non-response rate brought the final sample to 179. Purposive sampling was used to select the participants to ensure that only midwives who were directly involved in the provision of maternal health and PMTCT services in the facility were the ones who were included in the study.

2.6. , Research instrument and Data collection procedure

The data collection tool for this study was 22 items pre-tested structured questionnaire which was adapted from the Ghana Health Service PMTCT for HIV guidelines (Ghana Health Service, 2014). The questionnaire had two main sections. Section A solicited responses on participants' socio-demographic characteristics such as age, sex, marital status, religion, educational level, and years of experience. Section B solicited responses on the knowledge of midwives on the PMTCT guidelines. This section had questions that ranged from multiple choice questions and 5 points Likert scale with levels of agreement ranging from strongly agree, agree, undecided, strongly disagree, and disagree (McLeod, 2019). The questionnaire was validated through phase and content validity such that the academic supervisor of the researcher and senior program manager in charge of HIV prevention programs in the study district reviewed the questionnaire and offered very important suggestions that were used to improve the quality of the instrument. Therefore, the instrument was piloted at another CHAG facility and ambiguities and errors detected during the pretesting were corrected.

Data collection started in September 2022 and lasted for three months. The midwives providing maternal and child health services at the selected facility were initially engaged during their regular monthly meetings. They were informed about the study in general, its purpose and procedures as well as sampling procedures. The midwives were told

that the research team would return in September 2022 for the study. Reminders were put on their WhatsApp platforms as well. During the actual data collection period, all the eligible participants were approached at the end of their shift and were reminded again about the study. The questionnaires were distributed to them by the principal investigator (who is very experienced in research and data collection) and the participants self-administered the questionnaires. The participants answered the questionnaires in their offices, antenatal cubicles, or midwives' tables in the various units within the maternity block of the facility. The whole data collection procedure took close to 40 min on average. The questionnaires were collected cross checked for completeness and accuracy in filling. This procedure was repeated on a weekly basis until the estimated sample size was attained.

2.7. Data processing and analysis

Data entry was performed using Microsoft Excel 2016. The data file was subsequently exported to STATA software (version 14.) Data were summarized using frequencies, means, and proportions. Haq et al., (2022) category of identifying sub-groups of healthcare workers was used to categorize the ages of the participants into 21–30, 31–40,41–50, and 51–60. Years of professional experience were also categorized as <10 years and ≥10 years (Senoo-Dogbey et al., 2023).

The maximum score for each participant was 60 marks (100%). Accordingly, the knowledge scores were categorized into three levels, good, moderate, and poor. Thus, all scores greater ≥than 80% were graded as good, scores between 60% and 79% as moderate, and below 60% as poor Knowledge. The categorization corresponds with the traditional grading system utilized by many schools and researchers (Ramli et al., 2018). Since we intended to combine the items in the questionnaire to generate a composite knowledge score (Likert scale) of a set of items for different participants, the assigned scale was considered to be an interval scale. The measures for central tendency and dispersion for an interval scale that is the mean and standard deviation were computed per guidelines proposed by Joshi et al., (2015) and Boone, (2012).

Analysis of Variance (ANOVA) procedure was conducted to compare the PMTCT knowledge scores among the three subgroups of the studied sample (Age categories, educational levels, and years of professional experience). The PMTCT knowledge scores were dichotomized into "good' and 'poor knowledge of ≥50 and <50 respectively (Fageeh, 2014; Kamabu et al., 2022) and used in a binary logistic regression analysis to identify the factors that are associated with good PMTCT knowledge. Associations were reported as odds ratios with corresponding 95% Confidence Intervals (CIs), and all P-values<0.05 were considered to be statistically significant. The findings were displayed in charts and tables.

2.8. Ethical issues

Ethical clearance for the conduct of this study was obtained from the Institutional Research Department of the selected Christian Health Association of Ghana (CHAG) institution with clearance letter number *APH/ADM/RES-135/22.* Participants in this study provided written informed consent. Participation was voluntary and participants had the choice to withdraw or discontinue participation at any stage of data collection. Participants' information was held in confidence and privacy and anonymity were ensured.

3. Results

3.1. Socio-demographic characteristics of the participants

This study involved 179 midwives who were all females (100%) and aged between 21 and 59 years (mean age of 34.5 SD ± 7.7). Most of them (47.5%) were between the ages of 31 and 40. Close to half of the studied sample (51%) were married and belonged to the Christian faith (88.3%). Most of the participants graduated from midwifery institutions with certificates (62.0%). About 56% of the respondent had work experience of <10 years Table 1.

3.2. Knowledge level of midwives in the PMTCT program

This section presents findings on the level of knowledge of midwives on HIV for PMTCT guidelines. Most respondents (76.1%) mentioned correctly that pregnant women should have two HIV tests during the antenatal period and before delivery. The overwhelming majority of the participants (90%) were aware that HIV management should begin right after a woman tests positive for HIV. Also, 86% of the respondents were aware that CD4 cells are the virus's preferred target. Most of the participants (92%) knew that pregnant women could pass on HIV to the fetus. All participants (100%) recognized that breastfeeding is an important route for the mother-to-child transmission of HIV. However, only 59% were aware of all the routes for mother-to-child transmission. The majority of the respondents (90%) believed that antiretroviral therapy is a strategy for PMTCT. The majority of the participants (82%) believed a caesarean section is a form of strategy for PMTCT of HIV.

On the other hand, less than half of the respondents (35%) knew that vaginal birth constituted a risk for MTCT of HIV. However, most of the participants (92%) believed that rupturing the membrane artificially is a risk factor for MTCT of HIV.

3.3. Categorization of the knowledge level of midwives in the PMTCT program

The findings, as presented in Table 2, indicate that only 30 (16.8%) of the midwives have low Knowledge of PMTCT guidelines, about 63 (35.2%) of them had moderate knowledge, and 86 (48.0%) of them had good knowledge. This means that the overwhelming majority (83.2%) of the respondent had sufficient knowledge of PMTCT guidelines.

3.4. The comparison of midwives' PMTCT knowledge mean score by sociodemographic variables

The analysis of Variance (ANOVA) procedure was performed to compare the PMTCT knowledge scores among the sub-groups in the studied sample. The results presented in Table 3 shows the mean and standard deviation distribution of the PMTCT knowledge score across the background variables. The overall mean (composite knowledge score (Likert scale) of a set of items for different participants, the

Table 1
Socio-demographic characteristics of Participants N = 179.

Variable	Frequency	Percent (100%)
Sex		
Female	179	100.0
Male	0	0.0
Age		
21–30 years*	52	29.1
31–40 years	85	47.5
41–50 years	39	21.8
50 years and above	3	1.7
Religion		
Muslim	21	11.7
Christian	158	88.3
Educational level		
Diploma	111	62.0
Degree	65	36.3
Masters	3	1.7
Years of experience		
<10 years	101	56.4
≥10 years	78	43.6

*Age classification was done per guidelines by Haq et al., 2022, Kamabu et al., 2022; and Ministry of Health, 2007.

Table 2
Categorization of PMTCT knowledge level of midwives.

Knowledge level of midwives	Frequency	Per cent
Low knowledge Level	30	16.8
Moderate Knowledge Level	63	35.2
High Knowledge Level	86	48.0
Total	179	100.0

Table 3
The comparison of midwives' PMTCT knowledge score by their sociodemographic variables.

Variable	n	MeanKnowledge score	SD	F	Sig.
Age				5.64	0.001
21–30 years	52	61.73	17.63		
31–40 years	85	67.22	17.51		
41–50 years	39	76.93	16.95		
50 years and above	3	72.23	30.25		
Educational level				2.573	0.000
Diploma	111	55.56	10.53		
Degree	65	87.28	6.82		
Masters	3	100.00	0.00		
Years of experience				1.896	0.170
<10 years	101	66.17	10.775		
≥10 years	78	69.96	11.177		

assigned scale was considered to be an interval scale) knowledge score was 67.82 ± 18.30 which indicates a moderate level of knowledge at the population level.

The result indicated a statistically significant difference in knowledge scores obtained by the various age categories of the midwives (F = 5.64; P = 0.001) with midwives between 41 and 50 age category obtaining the highest mean PMTCT knowledge score of 76.93.

Furthermore, the results revealed a statistically significant difference in knowledge scores obtained by the midwives with the various educational levels (F = 2.573; P = 0. 000) with participants with a master's level of education obtaining the highest knowledge score of 100%,

The results also showed that there was no statistically significant difference in PMTCT knowledge scores between midwives with below 10 years of work experience and their other counterparts even though midwives with over 10 years of working experience had a mean PMTCT knowledge score of 69.96% compared to 66.17% for those below 10 years working experience (F = 1.896 = P = 0.170).

3.5. Factors associated with good knowledge of PMTCT for HIV among midwives

The results presented in Table 4 show the factors associated with good knowledge of PMTCT guidelines. The result from the table showed that the age bracket of 41 – 50 years and the master's level of education both demonstrated a statistically significant relationship with PMTCT Knowledge at the multivariate levels. The midwives who are between the age bracket of 41 – 50 years demonstrated significantly higher odds of having good PMTCT Knowledge compared to those within the age bracket of 21 – 30 years (aOR = 1.3: 95% CI 0.6 – 0.9), whereas midwives who had master's levels of education also demonstrated significant odds of having good PMTCT Knowledge compared with the midwives with diploma level of education (aOR = 14.9: 95% CI 0.1—0.9).

4. Discussion

This present study that sought to assess PMTCT knowledge among midwives in a selected CHAG facility in Ghana recruited and interviewed 179 midwives who were all females. These characteristics of the study population agree with observations by Likis & King, (2020) that midwifery is a profession that is composed almost entirely of women. Additionally, just a small percentage of participants (1%) had earned a master's degree, even though most of them (44%) had spent over 10 years working as midwives in the institution. This observation about the study population is contrary to the changing structure of midwifery education in most developed and developing countries. The changing structure is characterized by a dramatical shift from a predominantly practice-based apprenticeship model in a clinical setting to a profession firmly established within academia and higher education (Walker & Spendlove, 2018). The significantly low attainment of higher education observed in this population is probably due to the perception of midwifery being a specialized occupation. As a result, midwives feel a sense of success and fulfilment and hence are not inspired to pursue higher academic degrees.

In this present study, the majority of the participants gave correct responses to the questions assessing the knowledge of modalities in the PMTCT guidelines. For example, most of the participants (90%, 86%, and 92% respectively) understood that HIV has an affinity for CD4 receptors, that treatment of pregnant women having HIV must begin immediately after a positive test, and that pregnant women could transmit HIV to their unborn babies. These findings from this present study agree with reports by Mustafa et al., (2018), which indicate that nurses and midwives understood MTCT of HIV accurately.

On the other hand, some respondents demonstrated a lack of knowledge of HIV and how MTCT occurs. For example, 36% were unaware of the modes of HIV MTCT transmission whereas 31% were not

Table 4
Factors associated with good knowledge of PMTCT for HIV among Midwives.

Variables	PMTCT Knowledge		Unadjusted Estimates		Adjusted Estimates	
	Poor Knowledge	**Good Knowledge**	**OR (95% CI)**	**P-Value**	**OR (95% CI)**	**P-Value**
Age						
21–30 years	35 (67.3%)	17 (32.7%)	1.00		1.00	
31–40 years	44 (51.8%)	41 (48.2%)	0.9 (0.7–1.3)	0.76	0.9 (0.5—1.3)	0.86
41–50 years	12 (30.8%)	27(69.2%	1.3 (0.9—1.7)	0.07	1.3 (0.6 – 0.9)	**0.04****
50 years and above	1 (33.3%)	2 (66.7%)	1.1 (0.5 – 2.5)	0.50	0.0 (0.7—04)	0.15
Educational level						
Diploma	91 (82.0%)	20 (18.0%)	1.00		1.00	
Degree	1(1.5%)	64 (98.5%	1.0 (0.8–1.3)	0.87	−0.1 (1.4—–1.2)	0.69
Masters	0 (0.0%)	3 (100.0%)	1.6 (1.3—1.8)	0.00	14.9 (0.1—0.9)	**0.01***
Years of experience						
<10 years	57 (56.4%)	44 (43.6%)	1.00		1.00	
≥10 years	35 (44.9%)	43 (55.1%)	1.9 (0.6 0.2)	0.56	1.2 (0.9—1.6)	0.31

aware of the needed CD4 count range needed to initiate treatment of pregnant women who are infected with HIV. This observation is worrying since this lack of understanding has serious implications for the care and health education that would be provided for infected pregnant women and their significant others. Similar findings were reported by Iwoi et al., (2017) and Nkwabong et al., (2018), whose studies both revealed that healthcare professionals' knowledge of how to handle pregnant women with HIV and AIDS was inadequate.

The knowledge level categorization in this present study agrees with reports from Edo State Nigeria, where individuals with a high level of knowledge of PMTCT guidelines were in the majority followed by those in the moderate knowledge category (Ashipa et al., 2017).

In this present study, the overall mean knowledge score was 67.82 which indicates an overall intermediate or fair knowledge of PMTCT according to the level of knowledge categorization or grading designed for this study. This finding is slightly lower than the PMTCT knowledge mean score of 52.2 observed among Nigerian healthcare workers by Ndikom and Onibokun, (2007). The variation in the knowledge scores between this present study and the Nigerian study could probably be because not all participants in the Nigerian study were midwives and not all of them provided maternal health care services to pregnant women unlike the population of our study which involved only midwives who provided maternal health services to pregnant women. However, the overall PMTCT knowledge means a score of midwives in this study is similar to the findings of Mohammed et al., (2016) who reported a mean knowledge score of 65.7%. The overall moderate knowledge of PMTCT was evident in this study where about 89% of the participants agreed that women ought to have two HIV tests before the onset of labour and delivery. Midwives having this knowledge and understanding is helpful since it is per the Center for Disease Prevention and Control's recommendations, which calls for offering HIV screening in the first trimester and repeat screening in the third trimester for pregnant women, especially in regions with a high prevalence of HIV infection (Branson et al., 2006).

This present study identified a statistically significant difference in PMTCT knowledge across the various age categories such that as midwives get older, their marginal chances of having high PMTCT knowledge also increases. In other words, the likelihood that a midwife will have adequate PMTCT understanding improves slightly with age. The study again found that midwives belonging to the 41–50 years category had higher odds of having good knowledge of PMTCT for HIV. This finding is not new as a study conducted in South Africa also reported a statistically significant association between age and HIV knowledge (Fana, 2021).

The results imply that older midwives are more likely to demonstrate good PMTCT expertise than their younger counterparts. This present study revealed a statistically significant difference in the PMTCT knowledge means score across the various levels of education with midwives attaining a master's degree level having higher odds of having good knowledge compared to their counterparts with a diploma. This finding agrees with the observations of Nyarko et al., (2019) who also found the level of education to be significantly associated with PMTCT knowledge. This further demonstrates that respondents' understanding of PMTCT is significantly influenced by their level of education. Prioritizing higher education in the midwifery profession can enhance knowledge and positively affect PMTCT service delivery. Facility-led and sponsored training is needed to update the knowledge of midwives in current trends of PMTCT implementation strategy. The selection of midwives to benefit from such training should be considered such that younger midwives with less than a master's level of education are given special consideration and support.

5. Conclusion

Midwives in this study demonstrated a moderate level of knowledge of PMTCT for HIV guidelines at the population level. The age of the studied sample and a master's level of education were significantly associated with good knowledge of PMTCT guidelines. Midwives have relied largely on available protocols, recommendations, and guidelines on PMTCT to guide their practice. These documents have seen several revisions over time with the emergence of powerful empirical evidence now providing the basis for practice. Therefore support in the form of continuous education, training and updates on modern evidenced-based approaches to PMTCT are needed for midwives to be abreast with current information. Such continuous education and training programs are needed to achieve optimum knowledge of the PMTCT guidelines among midwives who are the main implementers of the PMTCT strategy in Ghana. In training the midwives, there is a need to engage older midwives with master's level education as peer educators. Frequent training on PMTCT strategy should be integrated into hospital in-service policy with much focus on updating the knowledge of younger midwives who may be new to the PMTCT implementation program.

6. Study limitations

Being a cross-sectional study, this present study only provided information on the status of occurrences of the phenomenon of interest at a given point in time.

CRediT authorship contribution statement

Dora Ganyo Donkor: Conceptualization, Methodology, Software, Data curation, Writing – original draft, Visualization, Investigation, Validation. **Senoo-Dogbey Vivian Efua:** Methodology, Supervision, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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