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## **HIV testing and knowledge on mother-to-child transmission among pregnant women attending antenatal care at Vanga hospital, Democratic Republic of Congo**

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## **Abstract**

**Background.** Human immunodeficiency virus (HIV) causes an infectious disease that can be transmitted from an infected mother to child. Prevention of Mother-to-Child Transmission (PMTCT) programs provide a range of services to women and children that can reduce the risk of vertical transmission of HIV. Unfortunately, PMTCT programs face many challenges in rural Democratic Republic of Congo, DRC.

**Methods.** A cross-sectional study was conducted among 460 pregnant women attending antenatal care at Vanga Hospital in the Vanga health zone, DRC from March 11<sup>th</sup> to June 25<sup>th</sup>, 2019. Serological tests were performed and a pre-tested questionnaire regarding HIV knowledge was given to all participants. Data were analysed with STATA 13.0. Descriptive statistics of key variables were computed and logistic regression was used to assess the association between participant's characteristics and knowledge of MTCT.

**Results.** Among the participants, 95.4% (439/460) reported that they have heard about HIV, 82.4% (378/460) indicated sexual intercourse as one of the routes of HIV transmission but only 30.4 % (139/460) mentioned MTCT as one of the routes. In addition, only 10.1% (46/460) had knowledge of the existence of PMTCT. Participant's age (>29 years), education level, previous antenatal care and previous HIV tests were significantly associated with knowledge of MTCT. Also, age (>29 years) and education level were significantly associated with previous HIV test uptake. Most of pregnant women 82.3% (376/460) reported that they have never been tested in the past for HIV infection and the prevalence was at 0.9% (4/460).

**Conclusion.** Knowledge of MTCT of HIV, previous uptake of HIV testing and prevalence was low. The rural setting of Vanga and insufficient HIV sensitization activities are considered contributors to this. While the low prevalence is a positive finding, much needs to be done to improve uptake of HIV testing and knowledge of HIV MTCT.

## **Introduction**

Human Immunodeficient Virus (HIV) may cause an infectious disease that can be transmitted from an infected mother to child. This may occur during pregnancy, labor or breastfeeding in the absence of antiviral treatment; approximately 25%–50% of HIV-positive mothers will transmit the virus to their newborns. <sup>(1)</sup>

Prevention of Mother to Child Transmission (PMTCT) programs provide a range of services such as counseling and testing, antiretroviral drug therapy, comprehensive antenatal care and safer delivery practices, as well as appropriate infant feeding to women and infants to fight HIV MTCT during pregnancy, labour and breastfeeding. These activities can reduce the risk

of vertical transmission of HIV to less than 1%.<sup>(1)</sup> However, HIV testing before and during pregnancy is critical to initiating antiretroviral therapy (ART) and elimination of HIV MTCT.<sup>(2)</sup>

PMTCT starts with testing pregnant women during the antenatal period. Testing requires some knowledge on HIV transmission and prevention, a positive attitude on the HIV test and the availability of the test for the pregnant women. Unfortunately, PMTCT programs face many challenges in some regions of the world.<sup>(3)</sup> These challenges include, inadequate resources, stigma and discrimination,<sup>(4)</sup> attitudes and skills of healthcare providers, cost, illiteracy, inability to secure husband's permission, the strategy used for HIV testing,<sup>(5)</sup> and accessibility to health care.<sup>(6)</sup> These challenges lead to the low coverage of HIV testing leaving a proportion of pregnant women with no access to these programs and expose them to transmitting the infection to their children. For example, a study in Ethiopia that analysed the 2016 Ethiopian Demographic and Health Survey dataset, showed that only 35.1% were tested for HIV and received the test results during pregnancy.<sup>(7)</sup>

Another contributing factor to the low coverage of HIV testing could be the lack of knowledge of PMTCT. Mothers with good knowledge of MTCT, understand the severity of HIV MTCT, can assess their susceptibility correctly and harness the benefit of testing.<sup>(8)</sup> For example, in Kumasi, Ghana, decisions by pregnant women to take up HIV testing and counseling (HTC) were mostly influenced by factors such as lack of information, perceptions of privacy and confidentiality, waiting time, poor relationship with health staff and fear of being positive,<sup>(9)</sup> while in Kenya, stigmatization was a major barrier to acceptance of HIV testing.<sup>(10)</sup>

The proportion of pregnant women accepting HIV testing depends on the country as well as if the region within the country is rural or urban. While HIV testing is obligatory for pregnant women in some countries, it is not in other countries. This can explain the disparities observed in Africa. For example, only 6.1% of pregnant women were tested in Chad compared to 98.1% in Rwanda.<sup>(11)</sup>

Regarding HIV knowledge, several studies in Africa have shown some good knowledge of PMTCT among pregnant women.<sup>(12, 13, 14)</sup> In DRC, the data available on HIV testing in the rural region is particularly limited except in cities like Lumbumbashi.<sup>(12)</sup> In addition, little is known on the prevalence of HIV and knowledge of PMTCT among pregnant women in rural setting. For this reason, we conducted a study to assess the knowledge of MTCT of HIV, HIV testing uptake and HIV prevalence among pregnant women attending antenatal care at Vanga hospital, DRC.

## **Materials and Methods**

### ***Study design and setting***

This was a cross-sectional, descriptive study. The study was conducted at the Vanga Evangelical Hospital. It is located in Kwilu province, in the Vanga health zone at 530 km east of Kinshasa, 35 km from Bulungu Hospital and 60 km from Djuma Hospital. The hospital has 479 beds and serves a health zone with a population of over 300,000 persons as well as patients from neighboring health zones. The hospital organizes antenatal care every Thursday for pregnant women with consultations of midwives and nurses.

### ***Sample size determination***

We used an online calculator ([www.openepi.com](http://www.openepi.com)) to calculate the required sample size. The HIV prevalence rate among pregnant women in DRC is uncertain, so we assumed a 50% prevalence rate, which was to be measured with a 5% precision and an alpha error of 5%. This gave a minimum sample size of 385 patients. We recruited 460 participants for this study.

### ***Study participants***

The study population comprised all pregnant women who visited the Vanga hospital for their antenatal (booking) visit during the study period. They come from Vanga and the surrounding villages to receive antenatal care from Vanga hospital. Since screening for malaria was performed systematically in the hospital for pregnant women during the first antenatal care visit, we included HIV serological tests during the study period from March to June 2019.

### ***Sampling technique***

Simple random sampling technique was adopted for the study. The study population consisted of all pregnant women who visited the Vanga hospital for their antenatal (booking) visit during the study period and data was collected from March 11<sup>th</sup> to June 25<sup>th</sup>, 2019.

Two midwives and a laboratory technician were recruited for the purpose of this study. During the study period, the midwives identified pregnant women attending ANC at the Vanga hospital for the first time for inclusion in the study. After the ANC consultations, the pregnant women were directed to the physician, who presented the study purpose and procedure and obtained a written informed consent from the participants.

### ***Inclusion and exclusion criteria***

We included those who attending the ANC for the first time for the ongoing pregnancy. Those who didn't attend for the first time were excluded.

### ***Data collection***

An interviewer administered structured questionnaire regarding HIV knowledge was elaborated from the model found in literature review. <sup>(15)</sup> The questionnaires were translated to French language, pretested and adapted before administration to the study participants.

Five milliliters (ml) of blood sample were collected from each study participant. The serum was separated and immediately used for the HIV serological test. Participant's socio-demographic and obstetric information, as well as medico-surgical history were collected from their antenatal care chart.

### ***Laboratory analysis***

Alere HIV Combo to detect the HIV serology status was used. This test detects antibodies to HIV-1 and HIV-2 and the detection of non-immunocomplexes (free) HIV-1 P24 antigen in human venous serum. We further confirmed all positive tests by further analysis with Inegol and Vikia test.

### ***Operational definition***

The knowledge outcome was defined based on the knowledge of the transmission of the infection from mother to child.

A pregnant woman was considered positive for HIV after a positive result of the analysis with the Alere HIV Combo to detect HIV serology status and confirmation with the Inegol and Vikia tests.

### ***Ethical consideration***

The research proposal was submitted to the Comité National d'éthique de la santé and received the approval number 100/CNES/BN/PMMF/2019. To participate, pregnant women were clearly informed about the HIV test and had to sign a written informed consent form after an explanation of the purpose, benefits and risks of participation. Investigations were performed following normal medical examinations. Participants who were tested positive were taken provided care of following the national HIV guidelines for pregnant women. <sup>(16)</sup>

### ***Data analysis***

Data were analysed with STATA 13.0. The descriptive statistics of the key variables were computed and presented as frequencies and percentages in Tables. Logistic regression was used to assess the association between participant's characteristics and knowledge of MTCT as well as association of participant's characteristics with previous HIV test uptake. Only

variables with significant values ( $p < 0.05$ ) in univariate analysis were included in multivariate logistic regression analysis

## **Results**

### ***General characteristics of participants***

We recruited 460 pregnant women for the purpose of this study. Majority, 58.6% (268/460) were aged between 18 and 29 years, 69.4% (317/460), had attended secondary school and 92.1% (421/460) were married. 79.1% (362/460) were multigravida while 77.2% (353/460) reported a previous abortion. 13.3% (61/460) reported a history of general surgery and 7.4% (34/460) had received a blood transfusion in the past (Table 1).

### ***Knowledge of participants on HIV and MTCT***

Majority, 95.4% (439/460) of the pregnant women reported that they have heard about HIV and the most common source of information on HIV was from friends 79.3% (363/460). 82.4% (378/460) of the participants indicated sexual intercourse as one of the routes of HIV transmission but only 30.4% (139/460) mentioned MTCT. Only 10.1% (46/460) of the participants reported that infection could be transmitted from mother to child and had knowledge of the existence of PMTCT, respectively. Regarding participant's knowledge on a period of HIV MTCT, 21%, 9% and 8.1% reported during pregnancy, labor and breastfeeding, respectively. 8.1% (37/460) of the participants knew that taking antiretroviral medication during pregnancy could reduce the risk of maternal-fetal transmission.

### ***HIV testing uptake***

Most pregnant women 82.3% (376/460) reported that they have never been tested in the past for HIV infection. 54.5% (249/460) indicated that the main reason for not being tested was that they had not been offered a test previously while 33.9% (155/460) reported that they were not at risk and should not be tested.

In our study, HIV prevalence was at 0.9% (4/460).

### ***Logistic regression analysis***

Study participants below 29 years of age and secondary level education or less, have a reduction of 9% (95% CI= 0.99- 6.45,  $p = < 0.01$ ) and 75% (95% CI= 0.12-0.53,  $p = < 0.01$ ) respectively in the odds of having knowledge of HIV MTCT compared to those aged  $> 29$  years with a college or university education. Likewise, participants who had previously attended antenatal visits and had taken HIV test before, had a 4.22 (95% CI= 1.85-9.63,  $p = < 0.01$ ) and 3.21 (95% CI= 1.78-5.76,  $p = < 0.01$ ) increased odds of having knowledge of HIV MTCT than those who had not attended respectively.



In addition, pregnant women in Vanga below 29 years of age and primary level education or less have a reduction of 7% (95% CI= 0.90-0.97,  $p < 0.01$ ) and 73% (95% CI= 0.10-0.74,  $p = 0.01$ ) respectively in the odds of previous HIV test uptake compared to those aged >29 years with a secondary or higher education level.

## **Discussion**

This study assessed the knowledge of MTCT of HIV, HIV testing uptake and HIV prevalence among pregnant women attending antenatal care at Vanga hospital. We found that 82.4% of the participants indicated sexual intercourse as one of the routes of HIV transmission but only 30.4 % mentioned MTCT. Most of pregnant women (82.3%) reported that they have never been tested in the past for HIV infection and the prevalence was at 0.9%.

In this study, 9.8% of the participants knew that HIV MTCT could occur during breastfeeding and 8.1% knew that antiviral medication reduces the risk. These results are different from the findings of the second DRC demographic and health survey (EDS-RDC II 2013-2014), which found that 59% of women aged 15-49 years were aware that the HIV virus could be transmitted from mother to child during breastfeeding and 32% knew that taking antiretroviral medication during pregnancy, could reduce the risk of MTCT. <sup>(17)</sup> This difference could be explained by the rural setting of the study, the local presumed HIV prevalence and education among our study participants. Indeed, Vanga is a rural area with limited opportunities for the population to have access to health education. In addition, the presumed low prevalence of HIV in Kwilu province leads to fewer interventions to fight HIV and the subject of HIV does not seem to be prioritised as a topic during antenatal care.

Only 30.4% of the participants recognised MTCT as a route of HIV transmission. This result can affect processes targeted at preventing MTCT, like screening and management of infected pregnant women. An infected pregnant woman who has accurate knowledge of how HIV is transmitted and of strategies for preventing transmission can reduce the risk of transmission by applying PMTCT. The result of 30.4% is far lower than the reports of two studies conducted in Ethiopia, where 83.5% and 84.5% of pregnant women knew about MTCT. Likewise, it differed from reports from Uganda (more than 60%) <sup>(18)</sup>, Nigeria (76.9%), <sup>(19)</sup> Kenya (52%), <sup>(20)</sup> and other sub-Saharan African countries. Again, the rural setting of the study and the low local presumed HIV prevalence could be an explanation for the poor knowledge of MTCT among the participants. Participants' level of education (college or higher) was significantly associated with knowledge of HIV MTCT.

The most common source of information among participants in this study was friends. People in Vanga resort to information from friends, which is often erroneous or incomplete because there are no standardized sources of good information on health topics like HIV in Vanga. The national prevalence estimates, EDS-RDC II 2013- 2014 on HIV is 1.2% and Vanga is located in the Kwilu province, which has one of the lowest HIV prevalence (0.1 %) in DRC. <sup>(17)</sup> The consequence of this presumed low prevalence is that fewer sensitization activities are undertaken on HIV prevention both within the healthcare setting and the community. As a result, less resources would be deployed to HIV MTCT related prevention activities.

For HIV testing uptake, only 17.3% of the participants in this study had been tested in the past. This is different from the results of the EDS-RDC II 2013- 2014 study, <sup>(17)</sup> where 13% of pregnant women were counseled about HIV prior to testing, had an HIV test and were aware of the results. When compared to studies previously conducted in Chad, Rwanda, Uganda and Zambia, the uptake of HIV testing was 6.1%, 98.1%, 92.4% and 96.9% respectively. <sup>(18)</sup> The uptake of HIV testing was found to be highest among women in Southern and Eastern African countries, whereas it was lowest among women in Western and Central Africa countries. <sup>(18)</sup> The low number of pregnant women that had previously been tested for HIV in this DRC study as well as some countries like Chad could be a reflection of each country's national HIV testing mandate. For example, in Rwanda and Uganda, it is mandatory for every pregnant woman who attends antenatal care (ANC) to be tested for HIV, <sup>(18, 21)</sup> while in DRC, a pregnant woman can refuse to be tested.

We found an HIV prevalence of 0.9%. This prevalence is lower than the DRC prevalence in the general population (1.2%) and the national prevalence among pregnant women (2.7%) but higher than the prevalence estimate for Kwilu province (0.1 %). <sup>(17)</sup> The low prevalence in the Kwilu province could be explained by the factors like the absence of armed conflict, less accessibility as a remote region, less commercial activities compared to the other eastern regions of Congo and previous HIV awareness campaigns over the past decade. However, this low prevalence could also be due to the reduction of the screening processes due to the lack of HIV test equipment. Compared to other countries, the prevalence is still low probably due to the reasons mentioned above. For instance, the pooled HIV incidence among pregnant women in sub-Saharan African and other countries was 2.1 per 100-person-years. <sup>(20)</sup> In Uganda, it was 2.9 per 100 women-years and 6.9% in western Kenyan. <sup>(23)</sup> Rurality has been identified as an HIV protective factor in Demographic and Health Survey 2007 (DHS-DRC 2007). <sup>(24)</sup>

### ***Limitations***

This study has some limitations Firstly, the participants were recruited during ANC visits, thus pregnant women who did not visit the clinic for antenatal care were not assessed. These results are therefore not completely representative of the pregnant women in the Vanga Health Zone. However, we believe it makes important contributions to a better understanding of the prevalence, knowledge of MTCT and uptake of HIV testing in Vanga, a potential representation of the situation in other rural regions of DRC.

## **Conclusions**

In this study, knowledge of HIV MTCT, previous uptake of HIV testing and prevalence among the participants was low. While the low prevalence is a positive finding, much needs to be done to improve uptake of HIV testing among pregnant women in Vanga and other rural regions. The rural setting of Vanga and insufficient HIV sensitization activities are considered to be major contributors to these. These gaps can be bridged by deliberate training of health workers to provide health education to pregnant women on MTCT in order to improve knowledge. Rural health workers should be adequately trained to play the key role of HIV counselling and the health authorities should ensure adequate provision of HIV testing materials in Vanga hospital and other healthcare settings to encourage uptake of testing. We recommend that similar and better representative studies be conducted to ascertain if the low HIV prevalence (0.9%) reported in our study is representative of other rural zones of DRC.

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**Table 1: Participant's socio-demographic characteristics (N=460)**

<b>Variable</b>	<b>Frequency (N)</b>	<b>Percentages (%)</b>
<b>Age</b>		
18-29	268	58.6
30-39	163	35.7
>39	26	5.7
<b>Education level</b>		
No formal education	51	11.2
Primary school	79	17.3
Secondary school	317	69.4
College/university	10	2.2
<b>Marital status</b>		
Unmarried	35	7.7
Married	421	92.1
Widowed	1	0.2
<b>Gravida</b>		
Primigravida	95	20.9
Multigravida	362	79.1
<b>Past abortions</b>		
Yes	353	77.2
No	104	22.8
<b>Past history of surgery</b>		
Yes	61	13.3
No	396	86.3
<b>Past blood transfusions</b>		
Yes	34	7.4

No	423	92.4
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Note. N; Sample size; Frequencies and percentages may not add up because of missing responses

**Table 2: Knowledge of participants on HIV and MTCT (N=460)**

<b>Variable</b>	<b>Frequency (N)</b>	<b>Percentages (%)</b>
<b>Knowledge</b>		
Yes	439	95.4
No	19	4.1
<b>Source of information</b>		
Previous antenatal care	35	7.6
Radio	74	16.2
Church	21	4.6
Health facilities	176	38.4
Newspaper	10	2.2
Friends	363	79.3
School	34	7.4
<b>Knowledge of route of infection</b>		
Sexual intercourse	378	82.4
Mother-to-child	139	30.4
Blood substance: injections	319	69.7
Spiritual/witchcraft	10	2.2
<b>Reported period of MTCT</b>		
During pregnancy	96	21.0
During labor/delivery	41	9.0
During breastfeeding	45	9.8
<b>Knowledge of existence of PMTCT</b>		
Yes	46	10.1
<b>Knowledge of prevention means</b>		
ARV to mother	37	8.1
ARV to child	13	2.8
Avoid breastfeeding	15	3.3
<b>HIV test in the past</b>		
Yes	79	17.3
No	376	82.3
Don't know	2	0.4



<b>If no test, why?</b>		
I am not at risk	155	33.9
I have not been offered a test	249	54.5
The results may be known by others	13	2.8
My husband refuses	2	0.4
<b>Prevalence of HIV</b>		
Positive	4	0.9
Negative	439	95.9

Note: Frequencies and percentages may not add up because of missing responses

**Table 3: Multivariable logistic regression analysis to assess the association between participant characteristics and knowledge of HIV MTCT (N=455)**

Variable	OR	95% CI	P value
<b>Age</b>			
18-29	1.00		
>29	0.91	0.89-0.95	<0.01*
<b>Education level</b>			
No formal education	1.00		
Primary school	0.59	0.42-8.26	0.69
Secondary school	0.58	0.28-1.21	0.15
College/university	0.25	0.12-0.53	<0.01*
<b>Previous antenatal</b>			
Yes	1.00		
No	4.22	1.85-9.63	<0.01*
<b>Previous HIV test</b>			
Yes	1.00		
No	3.21	1.78-5.76	<0.01*
<b>Past surgery</b>			
Yes	1.00		
No	1.03	0.51-2.03	0.93

Note. OR; Odds ratio, CI; Confidence interval.

**Table 4: Multivariable logistic regression analysis to assess the association between participant characteristics and previous HIV test uptake (N=455)**

<b>Variable</b>	<b>OR</b>	<b>95% CI</b>	<b>P value</b>
<b>Age</b>			
18-29	1.00		
>29	0.93	0.90-0.97	<b>&lt;0.01*</b>
<b>Education level</b>			
No formal education	1.00		
Primary school	0.15	0.01-1.80	0.13
Secondary school	0.27	0.10-0.74	<b>0.01*</b>
College/university	0.03	0.06-0.16	<b>&lt;0.01*</b>
<b>Previous antenatal</b>			
Yes	1.00		
No	1.68	0.75-3.75	0.21

Note. OR; Odds ratio, CI; Confidence interval.