

## Declining Knowledge of Mother-to-Child Transmission of HIV Among African Women Attending Antenatal Care: A Threat to Sustainable Development Goal 3

Uduak Bassey<sup>1\*</sup>, Michael Olabode Tomori<sup>2</sup>, Olumide Faith Ajani<sup>3</sup>, Azeezat Abimbola Oyewande<sup>4</sup>, Abiodun Olakunle Ogunniyi<sup>5</sup>, Freddy Rukema Kaniki<sup>6</sup>, Aneke Chukwunonye<sup>2</sup>, Sola Thomas Sunday<sup>7</sup>, Jimmy Aiden<sup>8</sup>, Timilehin Michael Omole<sup>9</sup>, Paul Olaiya Abiodun<sup>10</sup>, Felix Olaniyi Sanni<sup>11</sup>

<sup>1</sup>Department of Public Health, Walden University, USA

<sup>2</sup>Department of Public Health, University of Central Nicaragua

<sup>3</sup>Department of Logistics and Supply Chain Management, University of Science and Technology, Selangor, Malaysia

<sup>4</sup>Department of Family medicine, Lagos State Health service commission

<sup>5</sup>Management department, Nigeria Centre for Disease Control, Abuja

<sup>6</sup>Department of Health Sciences Eben-Ezer University, Minembwe, the Democratic Republic of the Congo

<sup>7</sup>Surveillance department, Nigeria Center for Disease Control, Jabi Abuja

<sup>8</sup>Technical Department, Malaria Consortium, Nigeria

<sup>9</sup>Department of Strategic Supply Chain Management, University of Roehampton, London, UK

<sup>10</sup>Department of Procurement and Supply Chain Management, Axios Foundation, Abuja, Nigeria

<sup>11</sup>Department of Public Health, Triune Biblical University Global Extension, New York, USA

### ABSTRACT

**Background:** Poor knowledge of mother-to-child-transmission (MTCT) of HIV infection is a serious threat to the Sustainable Development Goal-3 (SDG3) to eliminate AIDS as a threat to public health by 2030, particular among women of reproductive age. This study aimed to assess the level of knowledge the MTCT routes of HIV infection among women attending antenatal clinics in Nigeria from 2007 to 2016/2017.

**Method:** Secondary data were obtained from the United Nation Children's Fund Multiple Indicator Cluster Survey conducted in Nigeria in 2007, 2011, and 2016/2017. The data were analysed using IBM-SPSS version 25.0 to assess the trend in the knowledge of MTCT of HIV in the three periods.

**Result:** There was a significant decline in the knowledge of Nigerian women about MTCT from 89.5% in 2007 to 80.3% and 78.2% in 2011 and 2016/17 respectively. Factors such as age 45 & Above (adjusted odds ratio (AOR)=2.37, 95% CI=1.28-4.39; P=0.006), higher education (AOR=1.46, 95% CI=1.12-1.89; P=0.005), and residing in urban areas (AOR=1.48, 95% CI=1.13-1.91; P< 0.001), having higher education (AOR=3.25, 95% CI=2.74-3.86; P=0.007), were positively associated with the women knowledge of MTCT but no association was found between marital status and knowledge of MTCT.

**Conclusion:** Rural women, younger people, and illiterate should be focussed on when designing initiatives and policies to enhance the awareness of MTCT in Nigeria. Initiatives in these areas will improve the actualizing of the SDG3 in Nigeria by the year 2030.

### KEYWORDS

mother to child transmission; Antenatal care; knowledge of HIV

### CORRESPONDING

#### AUTHOR\*

Uduak Bassey

## INTRODUCTION

The Millennium Development Goals (MDGs) were in 2015 replaced with 17 Sustainable Development Goals (SDGs), each of the goals has definite targets to be accomplished by 2030.<sup>[1]</sup> Within the SDG system, the three health-related MDGs have been replaced by some overarching health objectives to ensure a healthy lifestyle and facilitate well-being for all ages (including universal access to HIV prevention services, sexual and reproductive health services and drug abuse and harm reduction services).<sup>[2]</sup>

The aims of SDG 3 include eliminating AIDS as a threat to public health by 2030 and achieving universal health care, access to medical care and access to safe and reliable drugs and vaccines of the highest quality and affordable value to all. Also, concerning improved health for mothers and their children, new sustainable development goals put greater priority in the prevention of mother-to-child transmission (MTCT) of HIV.<sup>[3]</sup>

PMTCT interventions focus on successful sharing of information on risk and preventative factors, with the primary aim of promoting involvement in HIV prevention activities; thus, it is necessary to determine the role of awareness in the use of maternal and child health services by women. Several studies have shown that general awareness of mother to child transmission (MTCT) of HIV has increased over the years in many sub-Saharan African countries where international efforts have focused towards the elimination of MTCT,<sup>[4-7]</sup> although knowledge prevalence is dependent on several factors. Apagu *et al.*<sup>[8]</sup> showed that knowledge preceded motivation to access preventive health services in their study population, especially among participants who had higher educational attainment and higher income. This is similar to the study by Faust *et al.*<sup>[6]</sup>, where the authors indicated that in the Nigerian context, amongst other things education, and wealth inequality impacted knowledge and therefore the adoption of preventive health behaviour. The authors found that people at the lower socio-economic levels of the population had limited information about HIV and its mode of transmission, particularly mother-to-child-transmission routes.<sup>[6]</sup> Although the knowledge of MTCT was better among females than male participants in their study population, that knowledge did not translate to women's awareness of risk reduction measures.<sup>[6]</sup>

Relevant data has also been documented in South Africa<sup>[4]</sup> and Ethiopia<sup>[9]</sup> where women had information about MTCT but were not fully aware of the exact mode of transmission or how child infection could be avoided.

This finding demonstrates that awareness campaigns may not concentrate on the risk reduction alternatives, and therefore may not contribute to the use of women's preventive health programs. This observation has been made by Katirayi *et al.*<sup>[10]</sup> whose findings from a two country-study pointed out that HIV prevention messages may not be accurate, or up to date, and may not be addressing the previous misconception that could limit message acceptance; thus reducing its impact in motivating women to take up preventive health care. Therefore, this study aims to assess the Knowledge of the PMTCT of HIV Among Women Attending Antenatal Care in Nigeria.

## METHODOLOGY

This study was based on secondary analysis of the UNICEF MICS collected in 2007, 2011, and 2016/2017 from the Nigerian populace. The data were retrieved and downloaded from the UNICEF electronic data management system. Before using the data, permission was sought from UNICEF, which usually requires online registration and receipt of their response via e-mail. Data for reproductive-aged women who had a live birth within two years of each survey were extracted. Entries without complete required information were removed from the study.

## POPULATION

The population of interest for this study included women between the ages of 15 and 49 who had been pregnant in the 2 years preceding the data collection. This is the ideal group for the study as PMTCT-related maternal services are integrated into antenatal and postnatal services in formal health sectors in Nigeria,<sup>[11]</sup> and the likelihood of adoption of services would be more evident among perinatal women. In 2010 Nigeria launched its national strategic response to HIV aimed at educating and encouraging uptake of preventive health services. This was implemented between 2010 and 2015 and led to an updated strategic framework that is currently being implemented (National Agency for the Control of AIDS, 2017). Hence, the review of data from the MIC Survey shortly before, during and after the introduction of the national strategy demonstrated whether the initiative in Nigeria generated any improvements in the women's awareness and the use of health systems.

### SAMPLING AND SAMPLING PROCEDURES

The sample of respondents for the MICS was drawn in multiple stages. First, a random sample of enumeration areas was selected proportionally to the size of each enumeration area. Then, within each enumeration area, a random sample of 20–30 households were selected. Finally, within each household, all women aged 15–49 years old were interviewed. A total of 27,093, 33,699 and 36,176 women were interviewed for each survey year. Sampling weights were then calculated and adjusted for nonresponse to ensure that the data are representative of the population of interest. For this study, the sample size was all eligible reproductive-aged women who had a live birth two years before each survey. The dependent variables were knowledge of PMTCT and use of PMTCT- related maternal health services. Knowledge of PMTCT was based on responses to question on awareness of routes of MTCT of HIV and responses were dichotomized as *good* and *poor* knowledge depending on how many correct answers participants gave. The independent variable was time measured at three points (2007, 2011, and 2016/2017). Time was categorized into three groups: time 1, time 2 and time 3. Other demographic characteristics such as marital status, education and age were also considered.

### DATA ANALYSIS

The abstracted data were exported into the SPSS version 25 software for analysis, ensuring all data elements were available and recoded variables into categories. Data with missing or incomplete information were excluded. Descriptive analysis was conducted for the variables detailing frequencies and percentages. Inferential analysis was also done using multivariate analysis to assess the association between dependent and independent variables. The level of significance was set at 0.05.

### ETHICAL PROCEDURES

Permission to use the UNICEF MICS round 3, 4, and 5 data were sought and obtained from UNICEF MICS team. Permission to use data was granted after filling an online request form which specified the purpose for use of data.

### RESULTS

#### Demographic characteristics of Nigerian women attending ANC in 2007, 2011, and 2016/17.

Table 1 shows an increase in the number of women attending antenatal care in Nigeria from 1021 in 2007 to 2,927 in 2011 and 4,155 in 2016/2017. Across all the three survey periods, the majority of women attending antenatal care were below 35 years with 80.4%, 80.0% and 78.3% in 2007, 2011, and 2016/17 respectively, though this number is decreasing by the year. Also, majority of these women had at least secondary education (71.5% -72.2% in 2007 and 2016/17), were married and reside in urban areas (50% in 2007, and 55.9% in 2016/17).

**TABLE 1:** Demographic distribution of the women attending antenatal care at various years

| Demographics      | Variable (n=8103) | Year of survey n (%) |                  |                    |
|-------------------|-------------------|----------------------|------------------|--------------------|
|                   |                   | 2007<br>(n=1021)     | 2011<br>(n=2927) | 2016/2017 (n=4155) |
| Age (years)       | 15-24             | 173 (16.9)           | 616 (21.0)       | 944 (22.7)         |
|                   | 25-34             | 648 (63.5)           | 1725 (58.9)      | 2309 (55.6)        |
|                   | 35-44             | 191 (18.7)           | 554 (18.9)       | 844 (20.3)         |
|                   | 45 & above        | 9 (0.9)              | 31 (1.1)         | 58 (1.4)           |
| Education         | Non-formal        | 7 (0.7)              | 53 (1.8)         | 397 (9.6)          |
|                   | Primary           | 284 (27.8)           | 758 (25.9)       | 759 (18.3)         |
|                   | Secondary         | 542 (53.1)           | 1561 (53.3)      | 2221 (53.5)        |
|                   | Higher            | 188 (18.4)           | 555 (19.0)       | 778 (18.7)         |
| Marital Status    | Married           | 961 (94.1)           | 2762 (94.4)      | 3909 (94.1)        |
|                   | Not married       | 60 (5.9)             | 165 (5.6)        | 246 (5.9)          |
| Area of residence | Rural             | 510 (50.0)           | 1091 (37.3)      | 1833 (44.1)        |
|                   | Urban             | 511 (50.0)           | 1836 (62.7)      | 2322 (55.9)        |

**The trend in the knowledge of various routes of MTCT in over three periods**

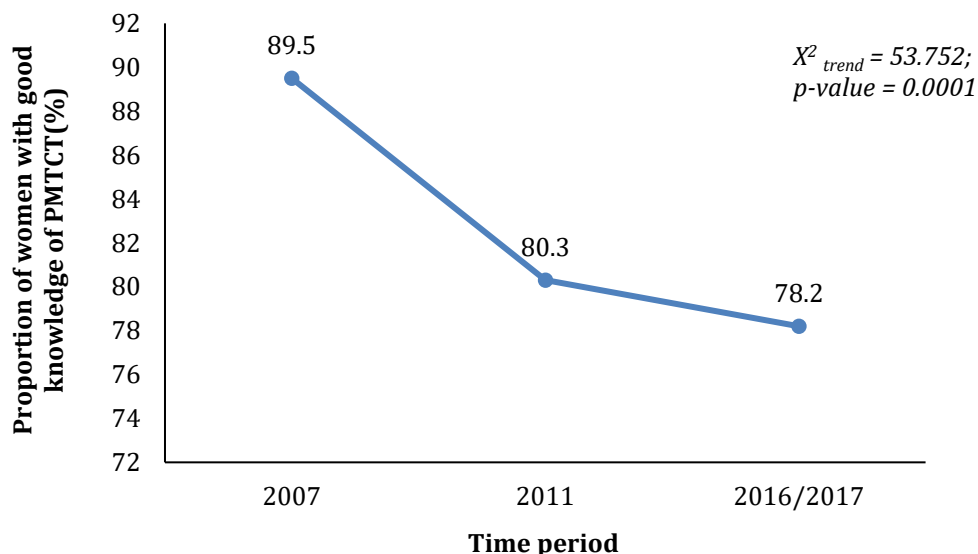
Table 2 shows the trend in the knowledge of women attending antenatal care in the three periods on various routes of MTCT of HIV. While 85.9% demonstrated good knowledge of MTCT during pregnancy in 2007, only 73.4% and 74.6% demonstrated good knowledge in 2011 and 2016 respectively ( $p < 0.001$ ). A similar trend was observed among the women on MTCT at delivery. All the women demonstrated high knowledge of MTCT through breastfeeding, yet, there was a significant decline in their knowledge from 87.6% in 2007 to 83.6% in 2016/17 ( $p < 0.001$ ). In 2007, only 3.8% of the women were unable to identify any route of MTCT of HIV, whereas, higher proportions were seen in 2011 (7.6%) and 2016/17 (10.6%).

**TABLE 2:** Trend in the knowledge of various routes of MTCT in over three periods

| Knowledge of MTCT                                  | Year of survey   |                   |                    | X <sup>2</sup> -value | P-value |
|--|------------------|-------------------|--------------------|-----------------------|---------|
|  | 2007             | 2011              | 2016/17            |                       |         |
| <b>AIDS from mother to child during pregnancy</b>  | 877 (85.9)       | 2147 (73.4)       | 3098 (74.6)        | 85.177                | <0.001  |
| <b>HIV from mother to child at delivery</b>        | 864 (84.6)       | 2220 (75.8)       | 3159 (76.0)        | 73.701                | <0.001  |
| <b>HIV from mother to child through breastmilk</b> | 894 (87.6)       | 2537 (86.7)       | 3472 (83.6)        | 39.067                | <0.001  |
| <b>Did not get any correctly</b>                   | <b>39 (3.8)*</b> | <b>223 (7.6)*</b> | <b>441 (10.6)*</b> |                       |         |
| <b>Got only one correctly</b>                      | 68 (6.7)         | 353 (12.1)        | 463 (11.1)         | 121.683               | <0.001  |
| <b>Got two correctly</b>                           | 175 (17.1)       | 502 (17.2)        | 487 (11.7)         |                       |         |
| <b>Got all the three correctly</b>                 | 739 (72.4)       | 1849 (63.2)       | 2764 (66.5)        |                       |         |

\*Indicates increasing trend

Figure 1 shows the distribution of participants for the dependent variables. Respondents were asked about the three routes of MTCT (AIDS can be transmitted from mother to child during pregnancy, AIDS can be transmitted from mother to child at delivery, AIDS can be transmitted from mother to child through breastmilk). Participants who responded correctly to two or three questions were categorized as having good knowledge of MTCT. Participants who had one correct answer or no correct answer to the three questions were categorized as having poor knowledge of MTCT. The proportion of women having poor knowledge on MTCT has been on the increase from 10.5% in 2007 to 21.8% in 2016/17 with overall 17.3% from the three survey periods. The overall good knowledge of MTCT among the women attending ANC in Nigeria from 2007-2016/17 was 82.7% (Figure 1) with a maximum in 2007 (89.5%) and minimum in 2016.17 (78.2%).



**FIGURE 1:** The trend in the knowledge of prevention of mother-to-child transmission over three periods.

### Factors associated with knowledge of MTCT among women attending ANC in Nigeria in 2007, 2011, and 2016/17

The knowledge of the PMTCT was significantly higher among women attending ANC in Nigeria in 2007 (89.5%) as compared with 2011 (80.3%) and 2016/17 (78.2%) ( $p < 0.01$ ). Good knowledge of MTCT of HIV routes increased with as the age increases from 76.1% for women aged 15 – 24 years to 87.9% for those above 45 years ( $p < 0.01$ ). Similarly, more educated people had better knowledge of MTCT of HIV (83.9%- higher education) than those without formal education ( $p < 0.01$ ). Also, the level of knowledge of MTCT was significantly higher among urban women (81.3%) than rural women ( $p < 0.05$ ). No significant association was found between the women's marital status and their knowledge of MTCT of HIV ( $p > 0.05$ ), (Table 3).

**TABLE 3:** Periodic and demographic distribution of Women's Knowledge of Prevention of MTCT

| Variables                | Knowledge of PMTCT of HIV  |                            | Total<br>n (%) | $\chi^2$ -value | P-value |
|--------------------------|----------------------------|----------------------------|----------------|-----------------|---------|
|                          | Good<br>Knowledge<br>n (%) | Poor<br>Knowledge<br>n (%) |                |                 |         |
| <b>Period</b>            |                            |                            |                |                 |         |
| Year 1                   | 914 (89.5)                 | 107 (10.5)                 | 1021 (12.6)    |                 |         |
| Year 2                   | 2351 (80.3)                | 576 (19.7)                 | 2927 (36.1)    | 66.205          | <0.001* |
| Year 3                   | 3251 (78.2)                | 904 (21.8)                 | 4155 (51.3)    |                 |         |
| <b>Age category</b>      |                            |                            |                |                 |         |
| 15-24                    | 1318 (76.1)                | 415 (23.9)                 | 1733 (21.4)    |                 |         |
| 25-34                    | 3813 (81.4)                | 869 (18.6)                 | 4682 (57.8)    | 29.189          | <0.001* |
| 35-44                    | 1298 (81.7)                | 291 (18.3)                 | 1589 (19.6)    |                 |         |
| 45 & above               | 87 (87.9)                  | 12 (12.1)                  | 99 (1.2)       |                 |         |
| <b>Marital status</b>    |                            |                            |                |                 |         |
| Currently married        | 6145 (80.5)                | 1487 (19.5)                | 7632 (94.3)    | 0.860           | 0.364   |
| Not married              | 371 (78.8)                 | 100 (21.2)                 | 471 (5.7)      |                 |         |
| <b>Educational level</b> |                            |                            |                |                 |         |
| Non-formal               | 344 (75.3)                 | 113 (24.7)                 | 457 (5.6)      |                 |         |
| Primary/ Secondary       | 4896 (79.9)                | 1229 (20.1)                | 6125 (75.6)    | 20.244          | <0.001* |
| Higher                   | 1276 (83.9)                | 245 (16.1)                 | 1521 (18.8)    |                 |         |
| <b>Area of residence</b> |                            |                            |                |                 |         |
| Rural                    | 3118 (79.5)                | 805 (20.2)                 | 3923 (48.4)    | 4.218           | 0.040   |
| Urban                    | 3398 (81.3)                | 782 (18.7)                 | 4180 (51.6)    |                 |         |

\*Statistically significant ( $p < 0.05$ ); \*\*  $\chi^2$  trend; CI = Confidence Interval

Compared to those who attended ANC in 2016, women who attended ANC clinics in 2007 were 2.4 times (adjusted odds ratio [AOR] = 2.31, 95% CI = 1.86–2.86) more likely to have better knowledge on MTCT of HIV. Also, women aged 45 & above were 2.287 ([AOR] = 2.37, 95% CI = 1.28 – 4.39) more likely to have better knowledge on MTCT of HIV than those between 13 – 24 years old. Women who attained higher education were 1.71 ([AOR] = 1.46, 95% CI = 1.12 – 1.89) more likely to have a better knowledge of MTCT of HIV than those without formal education. There was a significant association between the area of residence and knowledge on MTCT of HIV in the bivariate analysis, but this factor failed to retain its significant association for multivariate analysis (Table 4).

**TABLE 4:** Relationship between knowledge of MTCT and explanatory variables among attending ANC in Nigeria from 2007- 2016.

| Variable                 | Knowledge of MTCT |      |                    |                    | P-value |
|--------------------------|-------------------|------|--------------------|--------------------|---------|
|                          | Good              | Poor | COR (95% CI)       | AOR (95% CI)       |         |
| <b>Survey Year</b>       |                   |      |                    |                    |         |
| 2007                     | 914               | 107  | 2.38 (1.92 - 2.94) | 2.31 (1.86 – 2.86) | <0.001  |
| 2011                     | 2351              | 576  | 1.36 (1.01 – 1.28) | 1.10 (0.98 – 1.24) | 0.122   |
| 2016/17                  | 3251              | 904  | 1.00               |                    |         |
| <b>Age category</b>      |                   |      |                    |                    |         |
| 15-24                    | 1318              | 415  | 1.00               |                    |         |
| 25-34                    | 3813              | 869  | 1.38 (1.21 – 1.58) | 1.29 (1.13 – 1.48) | <0.001  |
| 35-44                    | 1298              | 291  | 1.40 (1.19 – 1.66) | 1.34 (1.13 – 1.59) | 0.001   |
| 45 & above               | 87                | 12   | 2.28 (1.24 – 4.22) | 2.37 (1.28 – 4.39) | 0.006   |
| <b>Educational level</b> |                   |      |                    |                    |         |
| Non-formal               | 344               | 113  | 1.00               |                    |         |
| Primary/ Secondary       | 4896              | 1229 | 1.31 (1.05 – 1.62) | 1.16 (0.93 – 1.46) | 0.194   |
| Higher                   | 1276              | 245  | 1.71 (1.33 – 2.20) | 1.46 (1.12 – 1.89) | 0.005   |
| <b>Area of residence</b> |                   |      |                    |                    |         |
| Rural                    | 3118              | 805  | 1.00               |                    |         |
| Urban                    | 3398              | 782  | 1.12 (1.01 – 1.25) | 1.08 (0.97 – 1.21) | 0.171   |

## DISCUSSION

### The trend in Knowledge of Prevention of Mother-to-Child Transmission

Although there have been significant results in achieving the SDG3 of ending AIDS globally by 2030 and deaths associated with AIDS have decreased by 45% since its peak in 2005,<sup>[12]</sup> yet poor knowledge of MTCT of HIV infection among women in low and middle-income countries can hamper the progress of this dream. According to Wynn & Jones,<sup>[12]</sup> ending mother-to-child HIV transmission requires urgent treatment for pregnant women living with HIV, the integration of HIV services and sexual and reproductive health care and the involvement of male partners in prevention and treatment.<sup>[12]</sup> This requires a good level of knowledge of MTCT routes of the women.

This study found a significant increase in the number of women attending antenatal care from 1021 in 2007 to 2927 in 2011 (which represents an increment of 186.7%) and 4155 in 2016 (representing 41.9% increment from 2011). However, there was a significant change in the knowledge of MTCT among reproductive-aged women across the three periods. There was a progressive decline in the proportion of women who had good knowledge of MTCT from 2007 (89.5%) to 2016 (78.2%).

Previous studies in Nigeria have shown that respondents could identify means of HIV transmission, but knowledge of MTCT was suboptimal.<sup>[6,13,14]</sup>

Though there has been a declining knowledge of MTCT from 2007 to 2016 as shown in this study, the value (78.2%) obtained in 2016 still shows some improvement over what was obtained about a decade ago in some studies in Nigeria. For example, Igwegbe & Ilika<sup>[14]</sup> found a high level of awareness of HIV (99%) among antenatal mothers at Nnamdi Azikiwe University Teaching hospital, Nnewi, Nigeria but low level of MTCT of HIV; only 46.1% were aware that HIV can be transmitted from mother to child through, breastfeeding (31.7%), and vaginal delivery (16.3%). In another report, the majority (90%) of women attending antenatal care in Federal Medical Centre, Idol Ekiti, Nigeria were aware that HIV can coexist with pregnancy, but only 68% were aware of mother-to-child transmission.<sup>[13]</sup> On the other hand, another recent study conducted in Akure, Nigeria found a higher knowledge of MTCT (83%) among attending ANC at University of Medical Sciences Teaching Hospital.<sup>[15]</sup> The difference between this study and other studies in Nigeria is that while the data obtained from this study is a National data, other studies obtained their information from particular

health facilities. This might partly explain the reason for the slight difference observed when the findings of this study are compared with others.

The low knowledge of MTCT in this study corresponds to recent studies in some parts of Africa and outside Africa. For example, Sama et al.<sup>[16]</sup> observed that among ANC attendees in a community in Cameroon, 76.7% of the women sampled could correctly identify routes of HIV transmission, but most (76.3%) had inadequate knowledge of MTCT of HIV. Alemu et al.<sup>[18]</sup> in their cross-sectional study in Ethiopia found that only 52% of their study population had comprehensive knowledge on MTCT despite active engagement in ANC at formal health centres. Another study among Ethiopia women found that only 34.9% of the study respondents could correctly answer all the five questions relating to MTCT of HIV.<sup>[9]</sup> The result of a qualitative study conducted in South Africa to determine the knowledge and awareness of MTCT among HIV positive women shows the majority of the respondents were aware of MTCT but did not have sufficient knowledge MTCT route of HIV.<sup>[4]</sup>

In China, it was reported that only 64% were aware that HIV can be transmitted from mother-to-child; 85% were aware of MTCT via transplacental, vaginal delivery (60%) and breastfeeding (20%).<sup>[19]</sup> A report from North India revealed that only half of the pregnant women attending the health care facilities were aware of MTCT and 68.3% knew that the transmission HIV infection could occur during pregnancy.<sup>[20]</sup>

This decline in knowledge of MTCT in more recent years, as shown also in this study, does not support the effectiveness of the National Strategic Framework that had been revised in 2010 to reflect the need (among other priority areas) for efforts toward the elimination of MTCT of HIV (National Agency for the Control of AIDS, 2017). Several other interventions have also been made by the government to improve maternal and child health outcomes <sup>[21]</sup>, so the expectation would have been that there would be an increase in the level of knowledge in subsequent years as the awareness campaigns continue.

### **Factors associated with the knowledge of mother to child-transmission of HIV among women attending antenatal care**

Factors that positively associated with increased knowledge of MTCT of HIV among Nigerian women attending ANC in all the three periods include being urban resident, having post-secondary education, and being older than 24 years ( $p < 0.05$ ). No significant association was observed between knowledge of MTCT and marital status ( $p > 0.05$ ). This is in agreement with the findings of some previous studies in Nigeria. In a study conducted to assess the trend in HIV knowledge in Nigeria from 2003-2013, factors such as age, rural or urban residency, and educational attainment were among the factors associated with knowledge of MTCT.<sup>[6]</sup>

The factors associated with increased knowledge of MTCT of HIV in this study corresponds to what was obtained in Northeast Ethiopia where being an urban resident and having primary education or more were among the factors positively associated with increased knowledge of MTCT though the study did not find any significant association between age and knowledge of MTCT.<sup>[22]</sup> Some other studies conducted among Ethiopia women also recorded similar associated factors including residing in urban areas and having higher education.<sup>[9,17,23,24]</sup> These studies also found no association between marital status and increased knowledge of MTCT of HIV infection, which is in agreement with the finding of this study. Some of the findings of this study disagree with what was obtained in Kenya where education level and age were not associated with knowledge of MTCT of HIV <sup>[25]</sup>. However, our report that marital status does not determine the level of knowledge of MTCT is in agreement with their finding.

Poor awareness of MTCT among women living in rural areas in this study may be due to remote setting and regional inaccessibility and limited availability of local health services compared to urban areas. Higher awareness reported in urban areas may be largely caused by the availability of media attention in urban areas. In this research, higher knowledge among well-educated and older women may be attributed to growing access to information for women when education is achieved. They may have access to distribution to mainstream media in this respect. Age advancements also increase women's exposure to knowledge about their well-being and increase their knowledge and sensitivity to relevant problems.

**CONCLUSION**

This study found a significant decline in the level of knowledge of MTCT of HIV infection among women attending ANC in Nigeria. Factors associated with the women's level of knowledge include education, age and place of residence but marital status had no significant association with knowledge level. This indicates the need to improve health education in both rural settings, health facilities and communities about mother to child transmission of HIV. More interventions are also needed to encourage women education in developing countries. Good knowledge of MTCT will help to actualize the SDG3 of ending HIV, ensuring a healthy lifestyle and facilitating well-being for all ages.

**REFERENCES**

- [1] United-Nations. About the Sustainable Development Goals – United Nations Sustainable Development. Nations. Available from: <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>.
- [2] WHO. From Millenium Development Goal (MDG) to Sustainable Development Goal (SD). World Heal Organ 2015.
- [3] WHO. Mother-to-child transmission of HIV. [homepage on the Internet] World Health Organizatio. Available from: <https://www.who.int/hiv/topics/mtct/about/en/>.
- [4] Ramoshaba R, Sithole SL. Knowledge and Awareness of MTCT and PMTCT Post-Natal Follow-up Services Among HIV Infected Mothers in the Mankweng Region, South Africa. *Open AIDS J* 2017;11:36–44.
- [5] Mutabazi JC, Zarowsky C, Trottier H. The impact of programs for prevention of mother-to-child transmission of HIV on health care services and systems in sub-Saharan Africa - A review. *Public Health Rev* 2017;38.
- [6] Faust L, Ekholuenetale M, Yaya S. HIV-related knowledge in Nigeria: A 2003-2013 trend analysis. *Arch Public Heal* 2018;76:1–12.
- [7] Gumede-Moyo S, Filteau S, Munthali T, Todd J, Musonda P. Implementation effectiveness of revised (post-2010) World Health Organization guidelines on prevention of mother-to-child transmission of HIV using routinely collected data in sub-Saharan Africa: A systematic literature review. *Med (United States)* 2017;96.
- [8] Apagu D., Tagurum Y., Hassan Z. Increasing PMTCT knowledge and uptake of services among women of reproductive age using Community Resource Persons (CORPs) in Shendam, Plateau, Nigeria. *Int J Infect Trop Dis* 2014;1:25–41.
- [9] Luba TR, Feng Z, Gebremedhin SA, Erena AN, Nasser AM, Bishwajit G, *et al.* Knowledge about mother-to-child transmission of HIV, its prevention and associated factors among Ethiopian women. *J Glob Health* 2017;7:1–9.
- [10] Katirayi L, Chadambuka A, Muchedzi A, Ahimbisibwe A, Musarandega R, Woelk G, T *et al.* Echoes of old HIV paradigms: Reassessing the problem of engaging men in HIV testing and treatment through women's perspectives. *Reprod Health* 2017;14:1–13.
- [11] Olakunde BO, Adeyinka DA, Olawepo JO, Pharr JR, Ozigbu CE,, *et al.* Towards the elimination of mother-to-child transmission of HIV in Nigeria: A health system perspective of the achievements and challenges. *Int Health* 2019;11:240–9.
- [12] Wynn M, Jones P. The Sustainable Development Goals. *Sustain Dev Goals* 2019.
- [13] Abiodun MO, Ijaiya MA, Aboyeji PA. Awareness and knowledge of mother-to-child transmission of HIV among pregnant women. *J Natl Med Assoc* 2007;99:758–63.
- [14] Igwegbe AO, Ilika AL. Knowledge and perceptions of HIV/AIDS and mother to child transmission among antenatal mothers at Nnamdi Azikiwe University Teaching hospital, Nnewi. *Niger J Clin Pract* 2005;8:97–101.



- [15] Irinyenikan T. Knowledge and practice of HIV testing for PMTCT among antenatal clinic attendees. *Trop J Obstet Gynaecol* 2019;36:232.
- [16] Sama CB, Feteh VF, Tindong M, Tanyi JT, Bihle NM, Angwafo FF. Prevalence of maternal HIV infection and knowledge on mother-to-child transmission of HIV and its prevention among antenatal care attendees in a rural area in northwest Cameroon. *PLoS One* 2017;12:1–13.
- [17] Alemu YM, Habtewold TD, Alemu SM. Mother's knowledge on prevention of mother-to-child transmission of HIV, Ethiopia: A cross sectional study. *PLoS One* 2018;13:1–11.
- [18] Alemu YM, Ambaw F, Wilder-Smith A. Utilization of HIV testing services among pregnant mothers in low income primary care settings in northern Ethiopia: A cross sectional study. *BMC Pregnancy Childbirth* 2017;17:1–8.
- [19] Luo Y, He GP. Pregnant women's awareness and knowledge of mother-to-child transmission of HIV in South Central China. *Acta Obstet Gynecol Scand* 2008;87:831–6.
- [20] Mukhtar M, Quansar R, Bhat SN, Khan SMS. Knowledge, attitude and practice regarding mother-to-child transmission of HIV, its prevention, and associated factors among antenatal women attending a health care facility in district Srinagar, North India: a cross sectional study. *Int J Community Med Public Heal* 2020;7:2622.
- [21] Fagbamigbe AF, Hurricane-Ike EO, Yusuf OB, Idemudia ES. Trends and drivers of skilled birth attendant use in Nigeria (1990-2013): Policy implications for child and maternal health. *Int J Womens Health* 2017;9:843–53.
- [22] Abteu S, Awoke W, Asrat A. Knowledge of pregnant women on mother-to-child transmission of HIV, its prevention, and associated factors in Assosa town, northwest Ethiopia. *HIV/AIDS - Res Palliat Care* 2016;8:101–7.
- [23] Birhane T, Assefa Tessema G, Addis Alene K, Dadi AF. Knowledge of pregnant women on mother-to-child transmission of HIV in Meket district, northeast Ethiopia. *J Pregnancy* 2015;2015.
- [24] Liyeh TM, Cherkose EA, Limenih MA, Yimer TS, Tebeje HD. Knowledge of prevention of mother to child transmission of HIV among women of reproductive age group and associated factors at Mecha district, Northwest Ethiopia. *BMC Res Notes* 2020;13:1–6.
- [25] Okoko NA, Owuor KO, Kulzer JL, Owino GO, Ogolla IA, Wandera RW, *et al.* Factors associated with mother to child transmission of HIV despite overall low transmission rates in HIV-exposed infants in rural Kenya. *Int J STD AIDS* 2017;28:1215–23.