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Determinants of comprehensive knowledge of mother to child transmission (MTCT) of HIV and its prevention among Zimbabwean women: Analysis of 2015 Zimbabwe Demographic and Health Survey

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ABSTRACT

Introduction: The global burden of human immunodeficiency virus (HIV) infection/acquired immunodeficiency syndrome has significantly decreased; however, new HIV infections decline slowly; this poses challenges to achieve Sustainable Development Goal 3.3. Mother-to-child transmission (MTCT) of HIV contributes to about 6.4% of all new pediatric HIV infections in Zimbabwe. Women's comprehensive knowledge of MTCT of HIV and its prevention is associated with poor utilization of MTCT services and therefore new pediatric HIV infections. We use Demographic and Health Survey (DHS) of 2015 to measure determinants of correct comprehensive knowledge of MTCT and prevention of mother-to-child transmission (PMTCT)of HIV in Zimbabwe.

Methods: We conducted a secondary analysis of 2015 DHS among 9955 women at reproductive age. Correct comprehensive knowledge of MTCT and PMTCT was measured as a composite score of five questions. We used weighing factors to account for the two-stage cluster sampling technique. Frequencies and relative frequencies were used to measure sociodemographic factors of women; we employed bivariate and multivariate logistic regression analysis to examine determinants of correct comprehensive knowledge of MTCT and PMTCT.

Results: About 70.5% of women have correct comprehensive knowledge of MTCT and PMTCT. In multivariate logistic regression analysis, factors strongly associated with correct comprehensive knowledge were age of women (where 15–19 years have lower adjusted odds ratio [AOR] than other age groups), residing in Mashonaland central, Masvingo, Harare, and Bulawayo provinces ($p < 0.005$), and receiving posttest counseling after HIV test (AOR = 1.49, 95% confidence interval [CI] = 1.12–1.98, $p = 0.007$). However, Christian women were less likely to have such knowledge (AOR = 0.57, 95% CI = 0.37–0.88, $p = 0.012$).

Discussion: 30% of women at reproductive age in Zimbabwe lack correct comprehensive knowledge of MTCT and its prevention. Such knowledge is associated with demographic factors such as age, religion, provinces, and receiving posttest counseling. The fact that MTCT of HIV still poses a challenge in the country, interventions toward the elimination of new newborn HIV infections should consider these factors.

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Zimbabwe infant; newborn infectious disease transmission; vertical HIV infections acquired immunodeficiency syndrome

1. Introduction

In the past decade, morbidity and mortality due to human immunodeficiency virus (HIV) infections in the world have been declining, thanks to preventive programs like the availability of antiretro viral (ARV) drugs and prevention of mother-to-child transmission (PMTCT) of HIV, among others [1]. Despite the ongoing success, close to 37 million people in the world were living with HIV infection in 2017, the majority of them were from sub-Saharan Africa (SSA) [1]. In the same year, about 940,000 deaths in the world were attributed to illness related to acquired immunodeficiency syndrome (AIDS), 51% less than the peak mortality in 2004 [1]. That is to say, HIV infections have the global public health importance and thus call for a continuous effort to fight the pandemic.

In the effort to curb HIV pandemic, the Joint United Nations Program on HIV/AIDS (UNAIDS) launched the Fast-Track Strategy in 2014 which targets low- and middle-income countries to meet the Sustainable Development Goal 3.3 (SDG: 3.3):end AIDS by 2030 [2]. Among the strategies to achieve SDG:3.3 was the reduction of new HIV infections to less than 40,000 annually by 2018 and to less than 20,000 by 2020 [2]. In 2017, estimated 1.8 million were new HIV infections, a 47% decline since the start of the epidemic in 1996 and the largest proportion of the decline (35%) was seen among children 0–15 years, thanks to among others the PMTCT program [1]. Owing to the increased coverage, from 51% in 2010 to 80% in 2017, the PMTCT program averted about 1.4 million new HIV infections among children [3].

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Similar to other priority countries, Zimbabwe has made remarkable achievement in the fight against morbidity and mortality due to HIV/AIDS. HIV mortality declined to 22,000 in 2017 which accounted for 63% decline since 2010; likewise, new HIV infections dropped to 41,000, a 44% decline from 2010 to 2017 [4]. The ongoing success is marred by the high HIV prevalence in the country (13.3% in 2017) and the number of new infections, whereby in 2015, MTCT attributed to 6.4% of all new HIV infections among children 0–14 years [4]. Hence, there is a need to enhance support and improve the HIV services among pregnant women if the country has to eliminate new HIV infections in pediatrics, and this can be achieved by identifying determinants of MTCT and PMTCT.

PMTCT in priority countries contributes greatly to the fall of new HIV infections [5]. However, the program is not without challenges. The challenges include the following: pregnant women are reluctant to enroll in the program, poor adherence, and discontinuation of ARV drugs during breastfeeding [3]. Consequently, among 180,000 new pediatric HIV infections in 2017, 50% were infected during breastfeeding [6].

Published studies have shown the importance of correct comprehensive maternal knowledge of MTCT and PMTCT in the fight against new pediatric HIV infections [7–9]. Correct comprehensive maternal knowledge and knowing places offering HIV testing correlates positively with maternal HIV testing [7]; it also increases access to HIV tests and maternal understanding of the risks of HIV infections [10]. In Zimbabwe, in 2016, women aged 25–29 were more likely to be tested than other age groups, and attending antenatal clinic (ANC) was one of the significant factors associated with HIV testing among women [11]. In the same country, youth were reported to be aware of HIV but lack knowledge of MTCT [12], and incorrect knowledge of MTCT was associated with low utilization of MTCT services [13] and poor adherence to ARV therapy during pregnancy [14]. Contrary to other published studies, Maruva et al. in Zimbabwe reported no association between maternal knowledge of HIV status and utilization of health services [15]. However, most of the published studies on knowledge of MTCT and PMTCT in Zimbabwe and SSA are facility based and therefore overestimate measure of effects and lack generalization.

In this study, we used Zimbabwe Demographic and Health Survey of 2015 (ZDHS) to assess determinants of correct comprehensive knowledge of MTCT and PMTCT. Understanding these determinants is critical in the fight against MTCT and the country to achieve SDG: 3.3.

2. Methods

2.1. Study design and setting

The 2015 ZDHS was conducted between July and December 2015 by Zimbabwe National Statistics Agency (ZIMSTAT) [16]. The study involved all 10 provinces in both rural and urban areas, namely Manicaland, Mashonaland (central, east, west, north, and south) Midlands, Masvingo, Harare, and Bulawayo [16]. Each province was subdivided to districts, districts to wards, and wards to census enumeration areas (EAs) which were areas in each ward conveniently selected as the sampling area [16]. A total of 400 EAs were selected, which comprised 166 EAs in urban and 234 in rural areas [16].

2.2. Study design and participants

A cross-sectional study was conducted in rural and urban areas [16]. Included in the study were women at reproductive age (15–49 years) permanently residing in households or visited a night before the interview, and the exclusion criteria were participants in institutional living arrangements such as army and police camps, boarding schools, and hospitals [16].

2.3. Sampling method and sample size

The ZDHS used the sampling frame from the 2012 Zimbabwe population census. The stratified, two-stage cluster sampling was used for selection of study participants, whereby the first stage included the EAs as the primary sampling unit [16]. The second stage included mapping of households in all clusters and selection of 11,196 households from 400 EAs [16]. In 11,196 households, 9955 women were eligible to participate in the study and interviewed successfully. Hence, the sample size used in this study is 9955 women aged 15–49 years.

2.4. Measurements

2.4.1. Outcome variable

The outcome variable in this study was comprehensive knowledge of MTCT and PMTCT. It was a composite score of five different questions, similar to Luba et al. [8]: (i) "Now I would like to talk about something else, have you ever heard of HIV or AIDS?" (ii) "Can HIV be transmitted from a mother to her baby during pregnancy?" (iii) "Can HIV be transmitted from a mother to her baby during delivery?" (iv) "Can HIV be transmitted from a mother to her baby by breastfeeding?" (v) "Are there any special medicines that a doctor or a nurse can give to a woman infected with HIV to reduce the risk of transmission to the baby?" Responses were coded as 1 = Yes and 0 = No. Aggregate score was computed.

The score of 5 = correct knowledge while else = incorrect knowledge.

2.4.2. Independent variables

Independent factors were demographic factors such as age, place of residence, provinces, marital status, religion, highest education level, and partner's education level. An exposure to media was defined as at least once a week listening to radio or watching TV or reading newspaper. The DHS calculated wealth index from the number and kinds of goods each household had. Materials like television set, a bicycle, or a car and household characteristics like sources of drinking water were some of the materials and characteristics the DHS used to calculate the wealth index of each participant [16].

2.4.3. Data analysis

Data were analyzed in Stata 13 statistical software [17]. We included survey setup in data analysis; specifically, we used sampling weights (probability weights), EAs as primary sampling unit (psu), and strata as secondary sampling units to account for the two-stage cluster sampling. The p value of <0.05 (two sided) was considered statistically significant, and the confidence interval was set at 95% and survey ("svy") commands were used in all analysis. Descriptive analysis was conducted for selected sociodemographic variables, and continuous and categorical variables were summarized using frequencies and relative frequencies. Bivariate logistic regression analysis was used to find the association between the outcome variable and predictor variables independently, and all factors found to be significant in bivariate analysis were subjected to multivariate logistic regression analysis to find the same association after adjusting for confounders and covariates. This study used unadjusted and adjusted odds ratios (AORs) to measure the associations in bivariate and multivariate logistic regression, respectively.

3. Results

3.1. Sociodemographic factors of women at reproductive age in Zimbabwe

Of 9955 participants, the mean age was 28.5 ± 9.2 years, and one-third of the study population were aged 20–29 years. Majorities (61.5%) of the study population were from rural areas, and Harare province comprised 18% of all study population (Table 1). Majority of participants were in union (61.8%), were Christians (94%), completed secondary level (65.6%), and were either richer or richest (48.3%). Close to one-fourth of participants were not exposed to mass media at all, among them; about half never watched TV, 42.8% never listened to the radio, and 57.2% never read newspapers (Table 1). When asked about their previous experience of visit to the ANC while pregnant, majorities of women tested for HIV (98.2%), got their HIV results (99.2%), and received posttest counseling (81.1%).

3.2. Comprehensive knowledge of MTCT and PMTCT

Table 2 summarizes the proportions of women with correct comprehensive knowledge of MTCT and PMTCT. Majorities of participants were aware of HIV and AIDS (99.1%) (Table 2). On the other hand, the majority of women became aware of MTCT in several instances, that is, during pregnancy (89.7%), delivery (86.3%), and breastfeeding (82.2%). Moreover, 94.8% correctly agreed that there were some drugs to prevent MTCT of HIV. When knowledge was measured as the composite score of five variables, the correct comprehensive knowledge of MTCT and PMTCT was found in 70.5% of women (Table 2).

3.3. Determinants of correct knowledge of MTCT and PMTCT

Table 3 shows the determinants of correct comprehensive knowledge of MTCT and PMTCT. In bivariate analysis, the correct comprehensive knowledge of MTCT and PMTCT was found to be significantly associated with age as well as with marital status ($p < 0.001$). In addition, compared to other religions, Christian women were 26% less likely to be associated with correct comprehensive knowledge of MTCT and PMTCT (odds ratio [OR] = 0.74, $p = 0.013$). Higher odds of correct comprehensive knowledge were found across all provinces compared to Manicaland, with more odds among Masvingo (OR = 3.38) and Mashonaland central (OR = 2.99).

The analysis revealed that having a partner with secondary or higher education was significantly associated with the correct knowledge of MTCT and PMTCT (OR = 1.93 and 2.33, respectively). Likewise, participants in union were 140% more likely to have correct knowledge compared to those never in union. In addition, this study found no association between correct knowledge and the highest level of education of participants, wealth, and exposure to media.

Among subpopulation of women who had ANC visit during their last pregnancy, correct knowledge was significantly associated with receiving posttest counseling after HIV test. However, testing for HIV and getting results after HIV test were not associated with the correct knowledge of MTCT and PMTCT.

In multivariate logistic regression analysis, the correct comprehensive knowledge of the MTCT and PMTCT was significantly associated with age (where higher

Table 1. Sociodemographic factors of women (15–49 years) in Zimbabwe in 2015 (N = 9955).

Factors	Number of respondents	Percentage
Age (years)		
15–19	2156	22.1
20–29	3438	33.7
30–39	2800	28.7
40–49	1561	15.6
Mean age = 28.5 (SD = 9.2) years		
Residence		
Urban	4521	38.5
Rural	5434	61.5
Current marital status		
Never in union	2666	25.2
In union	6015	61.8
Formerly married	1274	13.0
Religion		
Others	540	5.6
Christian	9385	94.0
Muslim	30	0.4
Provinces		
Manicaland	1019	12.7
Mashonaland central	993	8.9
Mashonaland east	910	9.6
Mashonaland west	1054	11.7
Matabeleland north	849	4.7
Matabeleland south	829	4.2
Midlands	1062	12.7
Masvingo	1046	11.9
Harare	1235	17.9
Bulawayo	958	5.8
Highest education level		
No education	106	1.3
Primary	2385	25.8
Secondary	6637	65.6
Higher	827	7.3
Partner's highest education level[a]		
No education	79	1.4
Primary	1186	21.0
Secondary	3944	65.7
Higher	727	10.3
Do not know	77	1.54
Wealth		
Poorest	1499	17.1
Poorer	1452	17.0
Middle	1549	17.6
Richer	2558	23.2
Richest	2897	25.1
Frequency of watching television (TV)		
Not at all	5054	54.1
Less than once a week	1381	14.3
At least once a week	3520	31.6
Frequency of listening to the radio		
Not at all	4482	42.8
Less than once a week	2112	22.2
At least once a week	3361	35.0
Frequency of reading newspapers		
Not at all	5446	57.2
Less than once a week	2778	26.9
At least once a week	1731	15.9
Exposed to mass media		
No	2230	23.8
Yes	7725	76.2
Tested for HIV during last pregnancy as part of antenatal visit[b]		
No	57	1.8
Yes	2852	98.2
Got results of HIV test during last pregnancy as part of antenatal visit[b]		
No	20	0.8
Yes	2832	99.2
Received posttest counseling for HIV during last pregnancy as part of antenatal visit[b]		
No	511	18.0
Yes	2320	81.9
Don't know	1	0.04

[a]= 6013.
[b]Subpopulations.
SD:standard deviation.

Table 2. Knowledge of MTCT and PMTCT among women (15–49 years) in Zimbabwe in 2015 (N = 9955).

Knowledge of MTCT and PMTCT	Number of respondents	Percentage
Ever heard HIV and AIDS		
No	89	0.9
Yes	9866	99.1
HIV transmitted during pregnancy		
No	1070	10.3
Yes	8796	89.7
HIV transmitted during delivery		
No	1294	13.7
Yes	8572	86.3
HIV transmitted during breastfeeding		
No	1696	17.8
Yes	8170	82.2
There are drugs to avoid HIV transmission to the child during pregnancy		
No	466	5.2
Yes	9137	94.8
Comprehensive knowledge of MTCT and PMTCT[a]		
Incorrect	2762	29.5
Correct	6841	70.5

[a]= 352 missing.

ORs were found as the age of women increases); those living in Mashonaland central, Mashonaland west, Midlands, Masvingo, Harare, and Bulawayo; and women who received posttest counseling after HIV test during their last ANC visit. On the other hand, Christians were less likely to have the correct knowledge (AOR = 0.57, $p = 0.012$). This study found no significant association between correct comprehensive knowledge of MTCT and PMTCT with residence, highest education level of the women or their partners, wealth, exposure to the mass media, testing of HIV, and getting results of HIV during last ANC visits ($p > 0.05$).

4. Discussion

This study found 70.5% of women in Zimbabwe had correct comprehensive knowledge of MTCT and PMTCT. This finding was higher than 34.9% reported in Ethiopia [8], 60% in Tanzania [18], 50% in Uganda [19], and 58.6% in the United States of America [20]. On the other hand, it was lower than 78% in Nigeria [21]. Though majority of participants in this study were aware of HIV/AIDS and drugs to prevent transmission during pregnancy, 10.3% reported no transmission during delivery, 13.7% were not aware of transmission during delivery, and up to 17% were not aware of transmission during breastfeeding. Of these parameters, the trends in maternal knowledge of HIV transmission during breastfeeding have been stagnant in Zimbabwe for the past three ZDHS surveys (2005–2015) [16]. This finding is alarming in Zimbabwe due to the fact that majority of new HIV pediatric infections elsewhere occur during breastfeeding according to UNAIDS report [6] and over 50% of 180,000 new HIV infections in 2017 were attributed to breastfeeding [6]. Moreover, comprehensive measurement of MTCT and PMTCT in the present study reveals one-third of participants (29.5%) had incorrect knowledge of MTCT and PMTCT, a higher proportion than when variables measured individually. Thus, preventative strategies geared to increase women's knowledge of MTCT and PMTCT should focus on increasing knowledge comprehensively.

Women's age in this study was positively associated with knowledge of MTCT and PMTCT; older women have a higher likelihood of correct comprehensive knowledge relative to age group 15–24 years. That is to say, the correct comprehensive knowledge of HIV in Zimbabwe is comparatively lower in adolescents (15–19 years), the age group that contributes greatly to the new sources of HIV infections in priority countries [6]. Hence, increasing comprehensive knowledge of MTCT and PMTCT should focus more on women aged 15–19 years, if the country has to reduce the source of new HIV infections.

Published studies have also shown the role religion plays in the fight against HIV/AIDS. In the present study, Christian women's were 43% less likely to have correct knowledge of MTCT and PMTCT compared to other religions contrary to published studies elsewhere [8,9,22].

Women living in urban areas are reported to have more comprehensive knowledge of MTCT and PMTCT than their counterparts due to, among others, better exposure and better access to health information [8,10,23]. However, our study found no such association. In addition, knowledge of MTCT and PMTCT was significantly associated with living in some provinces in this study. For instance, compared to Manicaland, women in Mashonaland central and Masvingo provinces were four times more likely to have correct comprehensive knowledge of MTCT and PMTCT. Likewise, Harare and Bulawayo were twice likely to have more knowledge of MTCT and PMTCT compared to Manicaland. Inconsistencies of the magnitude of correct comprehensive knowledge among rural and urban and different ethnicities have been reported in other countries [7,8]. While in Ethiopia, the differences in the likelihood of such knowledge were due to poor access to medical facilities due to poor infrastructure and poor access to mass media [8]; such reasons are not known in Zimbabwe and therefore call for further studies.

Utilization of HIV infection testing and counseling in women attending ANC was high in this study. Among the subpopulation of women reported to be pregnant in the last 3 years and attended ANC, 98.2% tested for HIV, 99.2% got their HIV results, and 81.9% received posttest counseling. However, the correct comprehensive knowledge of MTCT and PMTCT was 49% more likely associated with posttest counseling of HIV. Moreover, the correct comprehensive knowledge of MTCT and PMTCT is reported to increase awareness of HIV

Table 3. Association between correct comprehensive knowledge of MTCT and PMTCT and associated factors (bivariate and multivariate logistic regression).

Determinants	Crude odds ratios (OR)	[95% confidence interval]	*p*-Value	Adjusted odd ratios (AOR)	[95% confidence interval]	*p*-Value
Age (years)						
15–19	1.00			1.00		
20–29	2.49	[2.18–2.84]	0.0000	1.71	[1.19–2.47]	0.0040
30–39	2.84	[2.47–3.27]	0.0000	2.00	[1.32–3.05]	0.0010
40–49	2.48	[2.08–2.96]	0.0000	2.36	[1.24–4.48]	0.0090
Residence						
Urban	1.00					
Rural	0.94	[0.82–1.08]	0.4000			
Marital status						
Never in union	1.00					
In union	2.40	[2.12–2.72]	0.0000[a]			
Formerly married	2.30	[1.95–2.70]	0.0000[a]			
Religion						
Others	1.00			1.00		
Christians	0.74	[0.58–0.94]	0.0130	0.57	[0.37–0.88]	0.0120
Muslim	1.15	[0.35–3.85]	0.8160	1.00		
Provinces						
Manicaland	1.00			1.00		
Mashonaland central	2.99	[2.24–4.00]	0.0000	4.05	[2.43–6.75]	0.0000
Mashonaland east	1.42	[1.12–1.80]	0.0040	1.23	[0.79–1.89]	0.3600
Mashonaland west	1.85	[1.46–2.33]	0.0000	1.61	[1.04–2.49]	0.0320
Matabeleland north	1.54	[1.22–1.94]	0.0000	1.35	[0.83–2.18]	0.2230
Matabeleland south	2.24	[1.72–2.92]	0.0000	1.88	[0.99–3.56]	0.0520
Midlands	2.02	[1.49–2.73]	0.0000	1.82	[1.07–3.09]	0.0270
Masvingo	3.38	[2.66–4.31]	0.0000	4.15	[2.35–7.44]	0.0000
Harare	2.33	[1.80–3.01]	0.0000	2.55	[1.58–4.10]	0.0000
Bulawayo	1.76	[1.45–2.14]	0.0000	3.11	[1.65–5.89]	0.0000
Highest education level						
No education	1.00					
Primary	0.80	[0.45–1.43]	0.4500			
Secondary	0.87	[0.49–1.54]	0.6290			
Higher	1.06	[0.58–1.96]	0.8420			
Partner's highest education level						
No education	1.00			1.00		
Primary	1.62	[1.00–2.63]	0.0510	0.68	[0.23–1.96]	0.472
Secondary	1.93	1.20–3.10]	0.0070	0.81	[0.28–2.35]	0.695
Higher	2.33	[1.42–3.83]	0.0010	2.44	[0.86–6.90]	0.860
Don't know	1.01	[0.52–1.96]	0.9800	1.25	[0.34–4.63]	0.739
Wealth index						
Poorest	1.00					
Poorer	0.89	[0.74–1.08]	0.2370			
Middle	0.99	[0.83–1.17]	0.8660			
Richer	1.19	[0.98–1.46]	0.0800			
Richest	0.92	[0.78–1.10]	0.3610			
Exposure to mass media						
Not exposed	1.00					
Exposed	1.07	[0.95–1.21]	0.2900			
Tested for HIV during last pregnancy as part of antenatal visit						
No	1.00					
Yes	1.71	[0.97–2.99]	0.0610			
Got results of HIV test during last pregnancy as part of antenatal visit						
No	1.00					
Yes	1.47	[0.54–4.02]	0.4500			
Received counseling after HIV test during last pregnancy as part of antenatal visit						
No				1.00		
Yes	1.46	[1.12–1.91]	0.0050	1.49	[1.12–1.98]	0.007
Don't know	1.00			1.00		

[a]Omitted due to collinearity.

infection among women, consequently increasing their willingness to be tested, getting their results and posttest counseling as seen in other studies elsewhere [7–9]. However, in the current study, such knowledge is not associated with HIV testing and receiving of HIV results for reasons beyond this study.

This study found no significant association between correct comprehensive knowledge of MTCT and PMTCT and residential status (rural versus urban), the highest level of education of women or of their partners, wealth index, exposure to mass media, testing for HIV, and getting results after testing for HIV in ANC visits.

Our study used the data collected in 2015 and, therefore, may not reflect the recent situation in Zimbabwe. The study design was cross-sectional

and, thus, lack causality. The sampling method in this study ensured the national representation of the findings. Zimbabwe can use our findings to hasten PMTCT programs toward the elimination of MTCT in the country.

5. Conclusions

The correct comprehensive knowledge of MTCT and PMTCT in Zimbabwe among women at reproductive age in 2015 was 70.5%. Such knowledge was positively associated with the age of women, provinces, and receiving posttest counseling after HIV test in ANC and negatively associated with being Christian. To hasten the fight against new infections of HIV, preventative strategies should focus on increasing comprehensive knowledge in all age groups but specific to adolescent women (15–19 years) and should consider disproportionate of knowledge among provinces.

Disclosure statement

No potential conflict of interest was reported by the authors.

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