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Social and Demographic Characteristics of HIV-Positive Mother-Infant Pair and Their Association with Mother-To-Child Transmission of HIV in Vihiga, Kakamega, Bungoma and Busia Counties, Kenya: Chart Review

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Abstract:

Background: *The World Health Organization report indicates that in 2013~35 million people worldwide lived with HIV and AIDS. Of these, 3.2 million were children age <15 years. The proportion of women living with HIV has remained stable, at slightly <52% of the global figure. There are 13 high burden countries which account for 75% of the estimated 1.5 million pregnant women living with HIV in low- and middle-income countries. Furthermore, most of the HIV-infected children live in sub-Saharan Africa and were infected by their mothers through mother-to-child transmission (MTCT). Despite these statistics, social and demographic characteristics that are associated with MTCT rate at 18-24 months remains unknown. This study aimed to describe the social and demographic characteristics of HIV mother-infant pair and their association with MTCT rate at 18-24 months in Vihiga, Kakamega, Bungoma and Busia Counties, Kenya.*

Method: *A retrospective cohort study using prospectively collected data in Kenyan Ministry of Health (MOH)HIV Exposed Infant (HEI) register from 24 health facilities sampled across the four counties were sampled. The study population was HIV mother-baby pairs enrolled from January 2012 to June 2013. The social (marital status) and demographic (maternal age, maternal weight, baby's sex, baby's birth weight, level of health facility, county name) characteristics were assessed. The main outcome measure was infant HIV status at 18-24 months. Proportions were analyzed using Chi-square tests while associations between social and demographic characteristics and outcome were established using multiple logistic regression while controlling for possible confounders such as type of ARV prophylaxes, feeding options and CD4 count. P-values ≤0.05 were considered statistically significant.*

Results*: A total of 1751 HIV mother-baby pairs were enrolled in 24 health facilities. About 79.3% (1389/1751)mothers were legally married, 5.4% (95/1751) single, 5.4% (94/1751) widowed, 3.5% (62/1751) divorced, 1.8% (31/1751) cohabiting 0.9% (15/1751)separated and 3.7% (65/1751) had not stated. The MTCT rate at 18-24 months showed variations with marital status since the rates were highest amongst women in separated (26.7%), single (10.5%) and cohabiting (9.7%) relationships and lowest amongst divorced (3.2%) and legally married (4.9%) women. Separated women were about 7 times more likely to have HIV-negative babies as compared to widowed women (OR, 7.517, 95%CI, 1.344 – 42.031, p=0.022).*

Conclusion: *Separated HIV positive women are more likely to have HIV negative babies at 18-24 months as opposed to widowed women.*

Key words: *Marital status, Mother-To-Child Transmission of HIV, socio-demographic characteristics*

1. BACKGROUND

The HIV and AIDS remains one of the key challenges in the 21st century with political, economic, public health, social and scientific consequences globally. HIV and AIDS cases have been reported in all regions of the world, but most people living with the disease reside in low- and middle-income

countries, especially in sub-Saharan Africa that carries 60% of the world's disease burden despite having only 10% of the world's population[1]. UNAIDS estimates that there were 33.3 million [31.4 million–35.3 million] people living with HIV at the end of 2009. The estimated number of children living with HIV increased to 2.5 million [1.7 million–3.4 million] in the same period (2009). The proportion of women living with HIV has remained stable, at slightly less than 52% globally[1]. Data show that there are 13 high burden countries which account for 75% of the estimated 1.5 million pregnant women and 75% of children living with HIV in 2007 in low- and middle-income countries. All the affected countries (except India) are in sub-Saharan Africa, Kenya inclusive[2].

Mother-to-child transmission (MTCT) occurs when an HIV-infected woman passes the virus to her baby. This can happen during pregnancy, labour and delivery, or breastfeeding. Without treatment, around 15-30% of babies born to HIV-positive women will become infected with HIV during pregnancy and delivery[3]. A further 5-20% will become infected through breastfeeding [3]. In 2009, around 400,000 children under 15 became infected with HIV, mainly through MTCT. About 90% of these MTCT infections occurred in Africa where AIDS is beginning to reverse decades of steady progress in child survival[2]. A focus on women of reproductive age in the priority countries remains central to the AIDS response. However, the number of new HIV infections among them remains high, having declined by only 17% since 2009. More effort should be made to lower the risk of women acquiring HIV. This is not only important for the woman's health, but would also achieve the goal of eliminating new HIV infections among children. Additional effort should focus on provision of treatment to pregnant women living with HIV[4].In order to eliminate MTCT among children and also keep women healthy and well, it is important to reduce new HIV infections among women of reproductive age, especially among adolescents and young women[4].

In Sub-Saharan Africa where HIV prevalence is highest, women are most affected with an average of 13 infected women for every 10 infected men[5]. This difference is more marked among young people (15-24 years) with three out of four people living with HIV being females[5]. According to Kenya AIDS Indicator Survey (KAIS) 2007, the HIV sero-prevalence in the country is 7.8% among adults aged 15-49 years, being higher in women (8.7%) than in men (5.6%)[6].MTCT is one of the biggest health and development challenges in Kenya. Numerous studies have demonstrated associations between social and demographic factors such as marital status, level of education, gender, maternal weight, maternal age, baby's birth weight and the prevalence of HIV[7-15]. However, no known study from the literature search has been done to demonstrate how they affect the mother-to-child HIV transmission at 18-24 months especially in populations resident in western Kenya. In addition, fewattempts have been made to assess the extent of mother-to-child HIV transmission in different marital relationships such as in cohabiting, with an aim of broadening andrefocusing on the HIV prevention efforts towards realization of eMTCT in Western Kenya by 2015 and beyond. This study therefore sought to determine the social and demographic characteristics of HIV positive mother-baby pairs and their association with mother-to-child HIV transmission rates at 18-24 monthsin Vihiga, Bungoma, Kakamega and Busia Counties in western Kenya.

2. MATERIALS AND METHODS

Study design: Aretrospective cohort study using prospectively collected data from 24health facilities providing Prevention of Mother-to-Child-Transmission (PMTCT) and early infant diagnosis (EID) according to the Ministry of Health/NASCOP guidelines in Vihiga, Kakamega, Bungoma and Busia Counties were sampled.

Study population: The study population were HIV-positive women who received PMTCT services during the study period (January 2012 to June 2013) and their HIV-exposed babies who were at least 18-24 months of age.

Social and demographic variables: In order to address the objective of the study, social (marital status) and demographic (maternal age, maternal weight, baby sex, baby birth weight, county and level of health facility) characteristics of the study participants were assessed as independent variables. The main outcome variable was the baby's HIV status at 18-24 months.

Sampling and sample size: Multi-stage sampling technique was adopted for the health facilities. Stage one involved stratifying the health facilities by county (Vihiga, Bungoma, Busia and Kakamega

counties). Stage two involved categorizing the health facilities by levels (county hospitals, sub-county hospitals, health centres and dispensaries). The county hospitals that met the eligibility criteria were purposively sampled. Sub-county, health centres and dispensaries were randomly sampled. Due to missing data, all HIV-positive mother-baby pairs data from the sampled health facilities were extracted from period covering January 2012 to June 2013. As a result a total of 1751 mother-baby pairs data were extracted from the MOH HEI registers, which were the primary data collection tool, and missing variables from the registers corroborated with data from the patient files in Maternal and Child Health (MCH) and Comprehensive Care Clinics (CCCs)The MOH registers, patient files depicted missing information in varying degrees from facility to facility and from variable to variable with the mean of 18%.

Eligibility criteria: The inclusion criteria included a) health facilities providing PMTCT and EID as per the Kenyan MOH protocol and guidelines b) In charge of health facilities who were willing to give informed consent to participate in the study c) health facilities that started providing PMTCT services from at least January 2012 d) mother-baby pairs that were enrolled in the sampled health facilities between January 2012 to June 2013 and who provided informed consent.

Data analysis: Data collected was analysed using SPSS (Statistical Package for Social Sciences version 20). Descriptive statistics such as mean, median, standard deviation and range were used for continuous variables, whereas frequencies were used for categorical variables. The Chi-square tests were used to determine any associations between baby's HIV status at 18-24 months and categorical variables. Multiple logistic regression was used to assess the association between social and demographic characteristics and baby's HIV status at 18-24 months while controlling for possible confounders such as type of ARV prophylaxes, feeding options and CD4 count.*p-values* ≤ 0.05 were considered statistically significant.

Ethical considerations: This protocol was reviewed and approved by the Kenyatta National Hospital/University of Nairobi Ethics and Research Committee (P66/11/2012). Confidentiality was assured throughout the study.

3. RESULTS

3.1. Socio-Demographic Characteristics of Study Participants

The MOH registers which were the primary source documents for this study hadsevensocial and demographic variables: marital status, maternal age, maternal weight, baby's sex,baby's birth weight, level of health facility and county. Regarding the marital status, 15/1751 (0.9%) separated, 31/1751 (1.8%) cohabiting, 62/1751 (3.5%) divorced, 94/1751 (5.4%) widowed, 95/1751 (5.4%) single, 1389/1751(79.3%) were legally married and 65/1751 (3.7%) were not stated. There were variations in marital status across the four counties of Western Province as depicted in Table 1 below. These differences by county were statistically significant ($p<0.001$) with Kakamega county having proportionately less legally married women at 69% compared to the three other counties (n=272).

When grouped into age categories, the maternal age at enrollment was as follows: 1.1% (n=20/1751) were <18 years old, 19.7% (n=345/1751) were between 18 and 24 years old, 74.8% (n=1309/1751) were aged between 25 and 49 years,0.3%(5/1751) were greater than 50 years old and 4.1%(72/1751) did not state their ages. These were further stratified by county as shown in Table 1 below and these were comparable($p=0.329$).

Since it has been shown that baby's sex affects acquisition of HIV at birth, we assessed the distribution of the population based onbaby's sex. Overall 49.2% (n=861) of the babies born were females, 42.9% (n=751) were males and 7.9% (n=139) had no stated sex. Table 1 shows the differences in baby's sex by county and these differences were statistically different ($p<0.001$)since Vihiga County had more females while Kakamega County had less males compared to the other counties.

Table1. *Marital status, Sex of the baby and age at enrolment in MCH/PMTCT services by Counties, Jan 2012 to June 2013*

	Marital Status[a] $p<0.001$[a1]							Sex of the Baby[b] $p<0.001$[b1]			Maternal Age at enrolment in MCH/PMTCT services[c] $p=0.329$[c1]				
Counties	Cohabiting	Divorce-d	Legally Married	Separ-ated	Sing le	Widowed	Not stated	Female	Male	Not stated	<18 years	18-25 years	>25-49 years	>49 years	Not stated
Bungoma (N=408)	3.7% (n=15)	3.2% (n=13)	79.9% (n=326)	0.7% (n=3)	6.4% (n=26)	5.6% (n=23)	0.5% (n=2)	50.7% (n=207)	43.9% (n=179)	5.4% (n=22)	2.2% (n=9)	23.8% (n=97)	72.5%(n=296)	0.2% (n=1)	1.2% (n=5)
Busia (N=817)	1.1% (n=9)	4.3% (n=35)	83.2% (n=680)	0.7% (n=6)	5.8% (n=47)	4.8% (n=39)	0.1% (n=1)	51.2% (n=418)	44.6% (n=364)	4.3% (n=35)	0.7% (n=6)	20% (n=163)	78.9%(n=645)	0.2% (n=2)	0.1% (n=1)
Kakamega (N=394)	1.8% (n=7)	2.5% (n=10)	69% (n=272)	1% (n=4)	4.6% (n=18)	5.8% (n=23)	15.2% (n=60)	42.6% (n=168)	39.8% (n=157)	17.5% (n=69)	1.3% (n=5)	14.5% (n=57)	68%(n=268)	0.5% (n=2)	15.7% (n=62)
Vihiga (N=106)	0% (n=0)	3.8% (n=4)	83.0% (n=88)	1.9% (n=2)	3.8% (n=4)	7.5% (n=8)	0% (n=0)	53.8% (n=57)	42.5% (n=45)	3.8% (n=4)	0% (n=0)	17.9% (n=19)	80.2%(n=85)	0% (n=0)	1.9% (n=2)

Legend: *[a]The number (n) and proportion (%) of different marital status are shown across the four counties. Not stated means there was no documentation of the marital status in the Ministry of Health register;[a1]Statistical analysis as determined by χ^2 statistics.[b]Legend: The number (n) and proportion (%) of females and males shown across the four counties. Not stated means there was no documentation of the sex of the baby in the Ministry of Health registers; [b1]Statistical analysis as determined by χ^2 statistics; [c]The number (n) and proportion (%) of different age brackets are shown across the four counties. Not stated means there was no documentation of the ages in the Ministry of Health registers; [c1]Statistical analysis as determined by χ^2 statistics.*

Additional analyses looked at the distribution of baby's HIV serostatus in the context of maternal age, maternal weight and baby's birth weight. The overall mean maternal age at enrollment was 29.888 years (SD 5.895). The mean maternal age at enrollment was comparable between those whose children were HIV-negative (29.853 years) and HIV-positive (31.061 years) at 18-24 months (p=0.058) (Table 2). Likewise, the overall mean maternal weight was 58.469kg (SD 10.067). The mean maternal weight at enrollment was comparable between those whose children were HIV-negative (58.559kg) and HIV-positive (57.251kg) at 18-24 months (p=0.248) (Table 2). Finally, the overall mean birth weight for the babies was 3.258kg (SD 0.644). The mean baby's birth weight at enrollment was comparable between those who were HIV-negative (3.255kg) and HIV-positive (3.321kg) (p=0.470) (Table 2). These results collectively demonstrate that maternal age, maternal weight and babies' birth weight are not associated with baby's HIV status at 18-24 months in this population.

Table2. *Association between Maternal age and weight, Baby's Birth Weight and baby's HIV serostatus at 18-24 months*

Variable		HIV Negative	HIV Positive
Maternal Age	Median age in years	29.615	30.810
	Mean age in years	29.853	31.061
	95% CI	95% CI: 29.560,30.146	95% CI: 29.847,32.274
	SD	5.905	5.828
	Range	48.510	30.130
	Interquartile range	8.430	5.810
	p-value	p=0.058	
Maternal weight	Median weight in Kgs	57.000	56.500
	Mean weight in Kgs	58.559	57.251
	95% CI	58.046,59.072	55.072,59.431

	SD	10.090	10.044
	Range	99.800	53.000
	Interquartile range	12.000	13.770
	p-value	*p*=0.248	
Birth weight	Median weight in Kgs	3.000	3.000
	Mean weight in Kgs	3.255	3.321
	95% CI	3.218,3.293	3.117,3.524
	SD	0.640	0.739
	Range	7.000	3.400
	Interquartile range	0.800	1.000
	p-value	*p*=0.470	

Legend: *the median, mean, 95% Confidence Interval, range and interquartile range were calculated for maternal age, maternal weight and baby's birth weight and comparison made between HIV positive and HIV negative babies at 18-24 months. The statistical significance was determined using the p-values.*

Using the adult females' normal physiological weight as 60.0kg, the maternal weights were then stratified by the physiological weights ≤60.0kg and >60.0kg. Mothers weighing ≤60kg were 1014/1751 (57.9%) and those weighing >60kg were 583/1751(33.3%) and 154/1751 (8.8%) had not stated their weight. Low birth weights are considered <2.0kg and overweight >3.50kg. This criterion was used to stratify the baby's birth weights. Approximately 3.5% (62/1751) of the babies had birth weights <2.0kg, 44.2% (774/1751) had birth weights between 2.0kgs and 3.50kgs while19.1% (334/1751)had birth weights >3.50kgs and 581/1751 (33.2%) had their birth weights not stated as shown in Table 3.

In order to determine MTCT rate in children aged 18-24 months, the proportion of HIV positive babies at 18-24 months in HIV exposed babies was evaluated. The MTCT rate at 18-24 months showed variations with marital status (*p*=0.003). The MTCT rates are highest amongst women in separated 4/15(26.7%), single10/95(10.5%) and cohabiting 3/31(9.7%) relationships and lowest amongst divorced2/60(3.2%) and legally married67/1366(4.9%) women as shown in Table 3.

In order to test the associations between the social and demographic characteristics and HIV status at 18-24 months, a bivariate analyses between baby's HIV status at 18-24 months and level of the health facility, county, maternal age, marital status, maternal body weight, sex of the baby and bays' birth weight was carried out. Results demonstrated that marital status was a significant predictor of HIV status at 18-24 months (*p*=0.003) as shown in Table 3. In addition, babies born to mothers separated had approximately7 times likelihood of having HIV negative results at 18-24 months as compared to widowed women (OR=7.517, 95% CI: 1.344 – 42.031, *p*=0.022). However, there were no associations between the maternal weight (*p*=0.263), maternal age (*p*=0.174), babies' sex (*p*=0.341) and the baby's HIV status at 18-24 months(Table 3) after controlling for possible confounders such as type of ARV prophylaxes, feeding options and CD4 counts.

Table3. *Associations between the social and demographic characteristics and baby'sHIV status at 18-24 months*

Independent variables	**HIV status at 18-24 months**		χ^2	***p*-value**	**Odds Ratio**	**95% CI for OR**		***p*-value**
	Negative (n, %)	Positive (n, %)				Lower	upper	
Level of the health facility			0.063	0.996				0.593
County Referrals	122 (94.6%)	7 (5.4%)			Ref			
County Hospitals/ Mission Hospitals	915(94.4%)	54 (5.6%)			1.518	0.328	7.020	0.593
Sub-county hospitals	249 (94.7%)	14 (5.3%)			2.377	0.511	11.049	0.269
Health centers	343 (94.2%)	21 (5.8%)			1.785	0.414	7.701	0.437
County			0.583	0.900				0.592
Vihiga County (N=106)	94.3% (100)	5.8% (6)			Ref			

Independent variables	**HIV status at 18-24 months**		χ^2	***p*-value**	**Odds Ratio**	**95% CI for OR**		***p*-value**
Bungoma County (N=408)	93.9% (383)	6.1% (25)			1.649	0.468	5.808	1.649
Kakamega County (N=394)	94.2% (371)	5.8% (6)			1.494	0.441	5.066	0.519
Busia County (N=817)	94.9% (775)	5.1% (42)			0.995	0.258	3.839	0.994
Maternal Age at enrollment								0.031
>49years	5(100%)	0 (0%)			Ref			
<18 years	18(90%)	2(10%)	5.258	0.262	77888833.27	0.000	-	0.999
18years-25 years	325(96.7%)	11(3.3%)			21637915.58	0.000	-	0.999
25 years-49years	1216 (94%)	78 (6%)			76204025.36	0.000	-	0.999
Not stated	65 (92.9%)	5(7.1%)						
Marital status	Negative (n, %)	Positive (n, %)						0.138
Widowed	87 (93.5%)	6 (6.5%)			Ref			
Co-habiting	28 (90.3%)	3 (9.7%)			2.061	0.371	11.447	0.409
Divorced	60 (96.8%)	2 (3.2%)	**20.147**	**0.003**	1.072	0.169	6.816	0.941
Legally married	1299 (95.1%)	67 (4.9%)			1.249	0.375	4.164	0.717
Separated	11 (73.3%)	4 (26.7%)			**7.517**	**1.344**	**42.031**	**0.022**
Single	85 (89.5%)	10 (10.5%)			1.774	0.399	7.878	0.451
Not stated	59 (93.7%)	4 (6.3%)						
Maternal body weight								
≤60kg	938 (94.2%)	59 (5.8%)	1.254	0.263	Ref			
>60kg	551 (95.5%)	26 (4.5%)			1.167	0.680	2.001	0.576
Not stated	140 (92.1%)	12 (7.9%)						
Sex of the baby								
Female	811 (95.4%)	39 (4.6%)	0.907	0.341	Ref			
Male	703 (94.4%)	42 (5.6%)			0.915	0.550	1.523	0.734
Not stated	115 (88.5%)	15 (11.5%)						
Birth weight of the baby								
<2kg	58 (93.5%)	4 (6.5%)	2.270	0.321	Ref			
2-3.5kg	738 (96.1%)	30(3.9%)			1.529	0.478	4.889	0.474
>3.5kg	314 (94.3%)	19(5.7%)			0.597	0.311	1.146	0.121
Not stated	519 (92.2%)	43 (7.7%)						

Legend: *The table shows the independent categorical variables abstracted from the Ministry of Health registers with regard to the social and demographic characteristics for the mother-baby pairs. The number (n) and proportion (%) of HIV negative and HIV positive status at 18-24 months for different variables are shown. Not stated means there was no documentation in the Ministry of Health registers. The chi-square statistics and the P-value are also shown for each variable. The table also shows the results of the logistic regression analysis. The significance value, Odds Ratio and 95% confidence intervals are also shown for independent variable taking certain reference categories for each variable after controlling for possible confounders such as type of ARV prophylaxes, feeding options and CD4 count. Statistical analysis was determined by χ^2 statistics.County referral hospitals for the level of health facilities, Vihiga county for the County, >49years for maternal age, Widowed women for the marital status,≤ 60kg for maternal weight, females for sex of the baby and <2kg for baby's birth weight were considered as reference groups.Ref=Reference group.*

4. DISCUSSION

4.1. The Social and Demographic Characteristics of HIV Positive Mother-Infant Pair in Vihiga, Kakamega, Bungoma and Busia Counties, Kenya

The MOH HEI register has seven social and demographic characteristics being recorded on a routine basis namely marital status, maternal age, maternal weight, baby sex, baby birth weight, county and level of health facility. Generally, the study revealed approximately 79% of women were legally married, 5% single, 5% widowed, 3% divorced, 2% cohabiting and 1% were separated. These observations were in agreement with a study done at a rural tertiary care hospital in Maharashtra state

of India that showed that 70.53% were married and living with their spouse, 4% unmarried, 2.5% divorced and 2% separated[16]. High number of married persons having HIV and AIDS was also reported amongst attendees in voluntary counseling and testing centers of a medical college hospital in coastal Karnataka in 2012 and among HIV-positive women in 2014 enrolled in HIV care and support service in Amhara region, Ethiopia[17, 18]. Our findings also corroborated with findings that showed that most new HIV infections in sub-Saharan Africa now occur in married and cohabiting couples [18]. Consistent with previous studies carried out elsewhere in Kenya, majority (78.5%) of women HIV-positive were married[19]. However, Kenya Demographic Health Survey for 2014 showed that of the HIV positive women,55% were married, 5.1% cohabiting/living together, and 3.7% widowed[20]. By showing that married women are the majority, it ties in with the general Kenyan population where nearly 2 out of 3 Kenyans aged 15-64 are married or cohabitating[21]. The study findings was also in tandem with results of population-based data from Demographic and Health Surveys (DHS) on heterosexual behavior in Zambia in 2001-02 and in Rwanda in 2005 that revealed that most heterosexual HIV transmission takes place within marriage or cohabitation[8]. This goes on to demonstrate that married women represent the bulk of the HIV infected population amongst the sexually active group in Western region of Kenya. Focusing on HIV prevention and control efforts to this population will be critical in reversing the trend of pediatric HIV and AIDS and also aid in controlling the HIV and AIDS related morbidity and mortality.

However, the findings of the current study were inconsistent with others reported in Mwanza region, Tanzania that demonstrated that HIV infection was associated with being separated or widowed [7]. The study was also at variance with Surveillance of HIV infections among antenatal clinic attendees in Tanzania-2003/2004 that showed HIV prevalence to be higher among single women (9.7%) than married women (8.6%)[22]. It contradicted a study done in Mainland Tanzania in 2011 that showed marital status had no statistically significant association with HIV infection [11]. These contrasting results may reflect the epidemiological shift of the HIV epidemic pattern in Sub-Saharan Africa region from affecting mostly singles, separated, divorced and widowed women to now predominantly affecting married women/couples who now seem to be at a higher risk of HIV acquisition and transmission. The study further showed that there was a significant association between marital status and baby's HIV status at 18-24 months and that the baby is likely to be HIV positive if the mother was widowed. This concurs with our understanding that, in Western region of Kenya, the practices of widow cleansing and widow inheritance are common and viewed by many as contributing to the rapid spread of HIV in the general population. Widow inheritance is associated with apparent risk for HIV and STI acquisition and transmission since the wife inheritors don't use safer sex practices and the widows tend to have multiple partners for economic support. However, our finding contradict a prospective study in which there was no significant differences between the HIV infected and non-infected infants and mother's marital status among infants of sero-positive mothers[23].Qualitative studies is therefore needed to create a better understanding of the social, cultural and economic patterns and characteristics of the different marital relationships and further determine what could be the key determinants of the mother to child HIV transmission for different marital status beyond the known biological risk factors and whether these substantiate the quantitative results.

We also showed that the mean maternal age was 29.888 years, slightly older than most of the studies reported in the region. This finding contrast with those in Nigeria in which it was shown that HIV-positive mothers were young[16]and in Zambia where the mean age was 26.200 years [10]but compares with a study done in Western Kenya that showed the average age of women in PMTCT program was 29.400years[8]. The study also revealed that approximately 75% of women were aged between 25 and 49 years of age, the standard sexually active and productive age group. This compares favorably with findings from a study done at a rural tertiary care hospital in Maharashtra state of India in which it was demonstrated that 84.77% females were in the age group of 20-39 years[24] and in Mwanza Region, Tanzania that showed that mostly women aged 15-34 years were HIV infected[7]. Collectively, the findings are a pointer that the bulk of HIV infected women are young adults and they constitute the majority of HIV infected women in Western Kenya. Proven evidence-based interventions targeting this age-group needs to be designed and implemented in an effort to control the HIV epidemic and eliminate Mother-To-Child HIV Transmission by 2015 and beyond.

The study also revealed that there is no association between maternal age and baby's HIV status at 18-24 months (p>0.05) and this agreed with reviewed clinical records of 1088 mother-infant pairs within the Tinga the program in Lilongwe, Malawi that showed no association between HIV transmission and maternal age (p=0.164)[25]. It also concurred with a prospective study that depicted no significant difference between the HIV infected and non-infected infants with the same mean maternal age[25].Though not necessarily a comparable study, it contradicted studies done in Tanzania in 2003/2004 and 2011 and in Gondar, Northwest Ethiopia that revealed that the risk for HIV infection was significantly higher among women aged 25-34 years[11, 13, 21]. The findings also contrasts other observations in rural Northern Tanzania that revealed that the highest HIV prevalence was among women aged between 15-19 years[15].However, the study findings agreed with a prospective study in European countries that showed that maternal age were not a factor in risk of transmission[26].It therefore seems that maternal age may not be a key predictor of the baby's HIV status at 18-24 months despite the fact that majority of the HIV infected women are young adults.

The relationship between the baby's sex and the risk of HIV acquisition from a HIV-infected mother has not been clearly documented. This study showed that 50% of the babies born were females and 43% were males giving a male to female ratio of 0.86:1. This contrasted with study done in 2012 in Nigeria among HIV positive children that showed 52.7% males and 47.3% females giving a male to female ratio of 1:0.9[27]. However, these findings may not be conclusive due to ascertainment bias when recording the sex of the baby in the MOH HEI registers. In addition, the missing data was about 7% for the entry on sex of the baby in the registers compromising conclusion on some of the infant population. The study also showed that the baby's sex had no association with baby's HIV status at 18-24 months consistent with earlier reports[26]. However, this differed with other observations that revealed significantly more girls (12.6%) than boys (6.3%) were infected with HIV and at 6 to 8 weeks more girls acquired HIV (10.0%), compared with boys (7.4%)[13].In Kenya a study demonstrated that female sex are associated with HIV-1-specific CD8+ T-cell responses in HIV-1-exposed and that female infants were also more likely to have positive Elispot assays than male infants (p = 0.046)[9]. Taken together, these data demonstrate that there could be a likelihood link between baby's female sex and risk of HIV acquisition but more studies need to be done to determine the association between baby's sex and HIV status at 18-24 months born to HIV infected women in an African context.

We further revealed that approximately 44% of babies weighed between 2.0 -3.5kgs at birth. This is not surprising given that a previous study done in Nigeria in 2012 among HIV positive children showed that 40% of children's populations under the study weighed between 2.5 and 2.9kg at birth[27].We additionally demonstrated that baby's birth weight had no association with baby's HIV status at 18-24 months. This contradicted findings from a prospective study in Europein which it was shown that low birth weight had the strongest association with vertical transmission of HIV[26].Given that there was a huge missing data for birth weight(about 33%) and the fact that the different health facilities were using different weighing scales, more studies still needs to be done to ascertain if an association exists between the birth weights and the baby's HIV status at 18-24 months.

5. MTCT RATE AT 18-24 MONTHS BY MARITAL STATUS

The MTCT rate at 18-24 months showed variations with marital status. To our knowledge, this is the first epidemiological investigation of the association between HIV transmission from mother to child and the mothers' marital status. The MTCT rates at 18-24 months were highest amongst women in separated (26.7%), single (10.5%) and cohabiting (9.7%), widowed (6.5%) relationships and lowest amongst divorced (3.2%) and legally married (4.9%) women. However, this conflicts with a closely related study carried out in Nigeria that showed that HIV prevalence of divorced women were more than double those currently married/cohabiting with a sexual partner; and more than three times those that were never married [28].The current study showed that separated women are at approximately 5 times more likely to have HIV negative babies at 18-24 months post-delivery relative to widowed women (p=0.029).This probably could be due to the fact that becoming widowed is strongly associated with HIV positive status in this part of the country and HIV positive widowed women are likely to have had their spouses' die of HIV and AIDS. We hold the view that HIV among majority of widows is a result of infections acquired while in marital unions rather than as widows. The social neglect, cultural and sexual malpractices and high poverty levels could be contributing to their likelihood to have HIV positive baby at 18-24 months due to social, cultural and economic barriers.

However, no comparable studies exist in the literatures reviewed and therefore more studies with stronger designs need to be carried out to ascertain the association between marital status and risk of mother to child HIV transmission at 18-24 months and beyond. HIV counseling and testing services should reinforce efforts to provide widows with support and knowledge needed to make safe choices. Increasing financial independence through employment opportunities, income generating activities should be considered.

The greatest strength of this study is that it is conducted in the real world setting of Ministry of Health facilities in the four counties in Western Kenya. As a result, the findings of our study are more likely to reflect actual outcomes of MTCT rates within the public health facilities in Kenya and sub-Saharan African than do results from randomized clinical trials.

6. CONCLUSION

We found that most HIV positive mothers were legally married and fewer were in single, widowed, separated, divorced and cohabiting unions. Maternal age, maternal weight, baby's sex, baby's birth weight, county and level of health facilitywere not predictors of baby's HIV status at 18-24 months. The study also revealedthat separated women were about 5 times more likely to have HIV negative babies at 18-24 months as opposed to widowed women. HIV prevention and control efforts needs to focus on widowed women since they seem to have higher rates of MTCT rates at 18-24 months, if we are to reverse the new pediatric HIV infections and attain the eMTCT goals by 2015 and beyond.

6.1. Competing Interests

The authors declare that they have no financial or personal relationship (s) that may have in appropriately influenced them in writing this article.

6.2. Authors Contributions

MPO, JHO, MM and CO conceptualized, designed, conducted the study, analyzed and wrote the report and the manuscript.

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