HIV Counselling and Testing (HCT) Service Up-take and the Epidemiology of HIV/AIDS among Women Attending Ante Natal Care (ANC) in High and Low Prevalence States.

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Abstract- ***The current study seeks to establish the association between the uptake of HCT services before pregnancy in low and high prevalence states included in the study. The Null hypothesis in the study was the similarity of HCT up-take before pregnancy among women accessing ANC in states reporting high and low HIV prevalence. The study employed a cross-sectional comparative study design to explore the association between the up-take of HCT services and the epidemiology of HIV in study communities. Women attending ANC service in eight selected Global Fund supported health facilities drawn from four states were included in the study. Benue and Akwa-Ibom states were randomly selected from the list of states with very high prevalence rates while Ekiti and Kwara states were selected from the group of states identified with low HIV prevalence in the 2010 National Sentinel Survey. The study assumed uniform prevalence in the study states. Statistical analysis was performed in 2 steps:***

Step 1: Frequency runs were performed to evaluate each variable in the study.

Step 2: Generalized Linear Model (GLM) approach was performed to explore the distribution of respondents' characteristics and to explain the relationship between HCT up-take and HIV epidemics in the prevalence states. Since the outcome variable in this study has binary outcome (0= High prevalence; 1=Low prevalence), we assumed it had a binomial distribution. This step of analysis was then performed with generalized linear model with a logistic link function. Both uni-variate and multivariate analysis were performed to determine crude and adjusted Odds Ratios. Results reporting p<0.05 level were considered as strong evidence of robust effect. A total of 443 women were sampled in this study. Most respondents were in monogamous 349 (83.7%) marriage relationships and; live together 351 (80.9%) with their spouses in urban locations 306 (69.1%). Only 62 (14.0%) respondents attained graduate or postgraduate level of education. About three-fifths of all respondents were sampled from low prevalence states of Kwara and Ekiti, while the rest were from Benue and Akwa=Ibom states. Those in the upper age bracket of 30 to 49 years of age were more likely to be in low prevalence states (Crude OR=2.777, 95%CI: 1.848, 4.175, p<0.001) compared to those in high prevalence states. The majority of respondents in both low (98.9%) and high (98.3%) prevalence states have heard of HIV/AIDS. Surprisingly however, respondents who know only one or no correct mode of HIV transmission were likely to be in low than high prevalence states in the study, (Crude OR=9.250, 95%CI: 4.289, 19.950, p<0.001). About one tenth of respondents in both low and high prevalence areas did not know any mode of HIV transmission from mother to child; however, the majority of respondents (84.8% vs 90.4%) knew that HIV transmission from mother to child is preventable. Further analysis reveal that age at sexual initiation was significantly delayed beyond 19 years of age in states with low HIV prevalence

(Adjusted OR=4.805, 95%CI: 2.883, 8.011, p<0.001) than in states with high prevalence. Results indicate that the probability of the up-take of HCT before current pregnancy in respondents was more likely in low prevalence states (Adjusted OR=2.815, 95%CI: 1.675, 4.731, p<0.001) compared to high prevalence states. The result indicated that a statistically significant association exist between the up-take of HCT among women attending ANC and the epidemiology of HIV in high and low prevalence states. The Null hypothesis of no difference in HCT up-take in the study was thus rejected and the alternate hypothesis of a difference in the up-take of HCT in high and low prevalence states was accepted. Results reveal further that respondents in low prevalence states were more likely to have residences between 5 to 10 minutes walking distances to HCT centers compared to respondents in high prevalence states (Crude OR=7.137, 95%CI:2.337, 21.800. p=0.001) and (Crude OR=2.483, 95%CI: 1.335, 4.616. p=0.004). This study reveals that age at first sexual activity was the most important risk factor for HIV infection in the prevalence states. A delay in the initiation of early sexual activities could prevent new infection in young people and reduce the HIV epidemic even in high risk areas. In addition, association between the HCT up-take before current pregnancy in the prevalence states was statistical significant and could have benefit for women because of its potential to reduce the risk of HIV infection. In this regard we suggest that HCT services should be expanded beyond health facilities to places of worship, schools and other public places to ensure that people have access to services within their reach. Mobile services could also be provided in communities and towns to ensure that everyone has access to service. The campaign to encourage young people to delay the initiation of sexual activity could also be very helpful in the effort to prevent new HIV infections. Additionally, the campaign against HIV/AIDS should be sustained both in urban and rural areas as well as in high and low prevalence states because misconceptions about HIV/AIDS still exist out there. It is important that people, particularly women endeavour to ascertain their HIV status so as to further enhance their ability to protect themselves and the new born from HIV infection.

Index Terms- HIV, Prevalence, HCT (HIV Counseling and Testing) and Epidemiology.

I. INTRODUCTION

Nigeria is made up of 36 states and the Federal capital territory (FCT). The country occupies a total land mass of 923,768 square Kilometres [1]. The population of the country according to the 2006 population census was estimated to be 140,003,542 [2]. With an exponential annual growth rate of 3.2%, Nigeria population was estimated at 169,019,328 [3]. The report of the 2010 National sero-prevalence sentinel survey that was conducted among pregnant women attending ante natal care suggested that the national HIV prevalence was 4.1% down from 4.6% as reported in the 2008 sentinel survey [4,5]. In addition the 2010 sentinel report indicated that the trend of HIV incidence in Nigeria has been on the downward trend since 2003 [4]. This report suggested a possible positive impact of various interventions to contain the HIV epidemic in Nigeria. This was a departure from report of the sentinel survey of 2003, which suggested that HIV epidemic rose from 1.8% in 1991 and peaked at 5.8% in 2001. The considerable commitment and funding by the Federal Government of Nigeria and Development Partners in implementing key HIV/AIDS control and management strategies may be largely responsible for this decline. A key priority intervention has been the prevention of new infection since the cure for HIV/AIDS is still elusive. This is a multi-prong approach which includes knowing one's HIV status via the uptake of HIV counselling and testing (HCT) service among others. HIV counselling and testing remains the entry point to comprehensive HIV care and support services and the expansion of this services has been advocated as a central component of public health effort to reduce HIV incidence in Africa [6]. HCT services offers clients the opportunities to access early treatment, care and appropriate support service for those who are infected and preventive safe behaviours for those who test negative. HCT up-take is still very low in Nigeria. According to the NARHS report of 2007 "the proportion of respondents in the general population who have ever accessed HCT was 14.0%". The proportion of women age 15-49 years who accessed

HCT and got their results 2 years prior to the 2008 NDHS was 28.9% in urban and 6.7% in the rural areas. However the proportion of women who received ANC service 5 years prior to the 2007 NARHS was higher among urban (83.0%) compared to respondents in rural (54.0%) areas.

The current study seeks to establish the association between the uptake of HCT services and the epidemics of HIV in communities within states identified as reporting the highest and lowest HIV prevalence in Nigeria. This operations research would help to increase the evidence-based knowledge for improving and scaling up promising models in the prevention of HIV/AIDs infection and specifically addressing gaps in programming knowledge on the effective use of HCT to reduce the vulnerability of the disease in high HIV prevalence communities in the country.

1.2 Problem Statement

AIDS remains a major public health and social problem which has continued to defy solutions, thereby threatening the existence of the human race. However, the prevalence of HIV/AIDS is not uniform across the country. Findings from this survey revealed that HIV prevalence in Benue was 12.7%, Akwa-Ibom 10.9%, Bayelsa 9.1%, Anambra 8.7%, and F.C.T 8.6%, Plateau 7.7%, Nasarawa 7.5%, Abia 7.3%, and Cross-river 7.1% was above national average. While Kebbi (1.0%), Ekiti (1.4%), Jigawa (1.5%), Katsina (2.0%), Bauchi (2.0%), Yobe (2.1%), Zamfara (2.1%), Kwara (2.2%), Ondo (2.3%) and Osun (2.7%) states were reported to have very low HIV prevalence in the survey. The geo-political zones affected by high epidemic are the North-Central, South-South and South-East Zones while the South-West, North-East and North-East Zones are mostly low endemic zones. There is however variations in prevalence by zone, state and local government area. So, while the epidemic remains consistently high in the identified states of the country as mentioned above, other states continue to report very low epidemic. This scenario seems to suggest a gap in HIV programming knowledge in the sentinel locations with high HIV prevalence.

Based on the current HIV prevalence rate of 4.1% in the country, it is estimated that about 3.1 million people are living with HIV/AIDs. One and a half million of these require ARVs. The prevalence rose with increasing age group and peaked at 30-34 years with 5.7% after which it declined (Sentinel Survey, 2010). The most vulnerable groups are women and girls in their reproductive age. More worrisome is the fact that they are the gateway to HIV infection of children and infants. Earlier reports, such as the country progress report on Nigeria (2008-2009) indicate that more women were infected than men, and 27.5% of those most-at-risk populations who were infected with HIV were females, while 29.1% were infants born to HIV-infected mothers. The report also indicated that the most serious socio-economic impact of the epidemic is the growing numbers of AIDs orphans which was estimated at 2.175 million in 2008. Various reports suggest that efforts at halting the spread of HIV/AIDs through preventive and treatment intervention programs are yielding positive results. However, more work needs to be done to prevent new infection in women and girls. This will help in no small measure in contributing to the prevention of mother to child transmission of HIV. In that regard a key preventive strategy has been identified as the HIV counselling and testing service because when people know their HIV status it helps those who are negative to remain negative by avoiding risky behaviors and those who are positive to seek treatment early and take necessary precautions to avoid infecting others.

In Sub-Saharan Africa, about 61% of women and girls within the reproductive age group who attend antenatal care (ANC) were reported to be living with HIV in 2007[9]. These pregnant women pose a cause of HIV infection in children [10]. Therefore, access to HCT services prior to pregnancy may be a key factor that determine lower HIV incidence in vulnerable communities. This was identified in studies undertaken in Uganda [11] and Botswana [12] where uptake of HCT services for pregnant women prevented mother to child transmission. However, a study in Nigeria indicated stigma and fear of testing positive for HIV, expenditure on voluntary counselling and testing (VCT), poor access to VCT centers, attitude of health workers at VCT centers, confidentiality concerns at VCT centers as well as errors in test results as factors that drive HIV epidemic [13]. Some other studies have shown that

HCT is crucial in preventing high incidence of HIV by providing preventive counselling, correcting misconception about HIV, assessing risks as well as motivating behaviour change [14, 15]. Preventive packages in the HCT strategies are well identified in some research works [16, 17]. In some studies, access to HCT services were identified as a potential opportunity for patient openness thus, providing a relevant platform for reduction of fear and stigma in communities [18]. Despite the importance and assumed benefits in providing access to HCT services in years back, access and demand for such services has been a catastrophe in countries with severe epidemics [19-20].

Furthermore, a study by Physicians for Social Justice indicated that the uptake of HCT services among adult women in Jigawa state, Nigeria was 99.0%, while uptake among men within the same period was 90.0% [8]. A similar study in Ilorin Kwara state, Nigeria also indicated a high uptake of HCT services in both men and women [6]. Though these states were identified to report low prevalence of HIV in the 2010 sentinel report in Nigeria, the influence of HCT on the incidence or reported cases of HIV in the study communities was not clearly established in these studies. Understanding the factors that drive the HIV epidemic in any community is critical to helping policy-makers and program implementer come to a decision on the most appropriate interventions to mitigate the spread of HIV in the communities especially among women and girls of reproductive age group between 15 to 49 years of age who are most vulnerable.

1.3 Research question

The questions this study addresses are:

1. How does the accessibility and timing of HCT service uptake influence the epidemiology of HIV/AIDS in high and low prevalence states?
2. How can access to HCT services be increased in order to forestall the further spread of the disease in high risk areas or states?

II. STUDY OBJECTIVES, NULL HYPOTHESIS, OPERATIONAL DEFINITIONS AND MEASURES OF VARIABLES

2.1 Overall objective:

The overall objective of this study is to provide the much needed evidence in HIV/AIDS programming knowledge that would assist in reducing the prevalence of HIV infection in vulnerable individuals and communities, by generating the understanding of the factors that account for HCT uptake in women and girls.

2.2 Specific objective:

The specific objectives of the study are as follows:

1. To assess the accessibility and timing of HCT services uptake in high HIV prevalence states of Benue and Akwa-Ibom as well as in low prevalence states of Kwara and Ekiti within a period of 12 weeks by the research team to enable the team determine the influence of HCT service uptake as an effective HIV preventive service.
2. To examine the influence of HCT service uptake on HIV epidemiology in selected states with differential prevalence rates.
3. To quantify the association between HCT service uptake and HIV/AIDS epidemic of prevalence in selected states

2.3 Null Hypothesis

Ho: There is no difference in the up-take of HCT in women before pregnancy in states reporting high and low prevalence of HIV/AIDS.

2.4 Operational definitions and assumptions

- HIV counselling and testing (HCT), means any form of counselling and testing service including VCT and PICT services.
- HCT uptake implies receiving HIV counselling, testing and receiving the test result
- Communities with >1000 people, and have motor able roads, water and electricity supply were regarded as urban while those with < 1000 people without motor able roads, water and electricity supply were referred to as rural communities.
- Epidemiology is measured by the prevalence of HIV in 2010 National Sentinel Survey in states.

- It is assumed that the prevalence of HIV/AIDS is uniform in each selected study state.

2.5 Measures of variables

The outcome variable is the risk of HIV in prevalence states i.e high or low prevalence. Time of HCT uptake was measured by uptake before or during pregnancy. While place of uptake will be determined by the type of health facility i.e. tertiary, secondary or primary health facility. Location of the health facility will be assessed by urban or rural location, while referral source will be measured by mass media, peer educator or by hospital staff. Type of marriage would be monogamy or polygamy and proximity to HCT centre would be measured by the time it takes to get to the centre by walking.

III. METHODOLOGY

3.1 Research design

This analytic study employed a cross-sectional comparative study design to explore the association between the epidemiology of HIV/AIDS and the up-take of HCT services by women attending ANC service in selected health facilities included in the study.

Many cross sectional studies focus on describing as well as comparing groups. Additionally this study design has the advantage of supporting the exploration of large numbers of associations between variables in attempts to identify the causes or risk factors for diseases. Though cohort studies are best designed to study causes and effects relationships of disease situations, they often times require long time scales, large study populations and are expensive to implement unlike cross-sectional studies. A case control study design may not be appropriate for this study since the status of study participants was not known a priory to enable sampling.

3.2 Selection of study locations

The report of the 2010 National Sentinel Survey identified Benue, Akwa-Ibom, Bayelsa, Anambra, and F.C.T, Plateau, Nasarawa , Abia , and Cross-river as states reporting the highest prevalence of HIV above national average. Similarly Kebbi, Ekiti, Jigawa, Katsina, Bauchi, Yobe, Zamfara, Kwara, Ondo and Osun states were identified to have very low HIV prevalence in the survey. By simple random sampling technique Benue and Akwa-Ibom states were selected from the list of states with very high sentinel sites while Ekiti and Kwara states were selected from the group of states identified with low prevalence (See Figure 1.0).

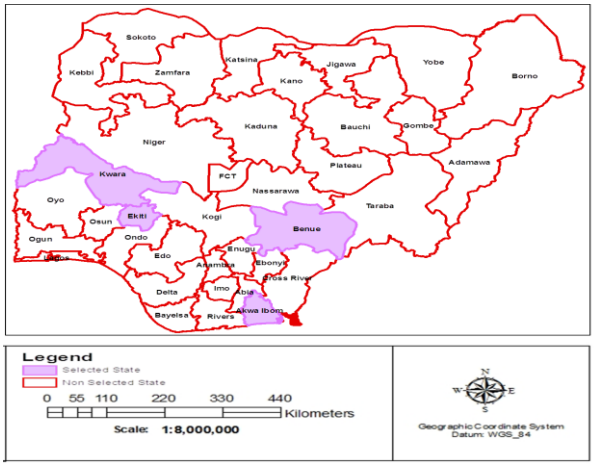


Figure 1.0 Map of Nigeria showing selected states in the study

Sampling frames of all existing and up to date Global Fund supported health facilities in the selected states were obtained from the National Agency for the Control of AIDS (NACA). From the listing, facilities were stratified to urban/rural locations. Two facilities were then selected randomly using lottery method from each stratum, in each selected state as shown in table 2.1.

Table 2.1 States and Health facilities selected for inclusion in the study.

S/N	State	Sero-prevalence	Facility	Location
1.	Akwa-Ibom	10.90%	i. St Luke's Hospital, Anua, Uyo	Urban
			ii.PHC Ikot Ekara, Ward 3, Ikot Abasi	Rural
2.	Benue	12.70%	i. General Hospital, Oju	Rural
			ii. NKST Hospital, Mkar	Urban
3.	Kwara	2.20%	i. Specialist Hospital, Offa	Urban
			ii. General Hospital, Patigi	Rural
4.	Ekiti	1.40%	i. State Hospital, Ikole*	Rural
			ii. St. Gregory Hospital, Ado-Ekiti	Urban

* A semi-urban location was included in the study because there are only two sites supported by Global Fund in the state. † 2010 HIV Sentinel Report.

3.3 Sample size determination

Sample size calculations were performed using PASS 11.0 soft ware. The mean prevalence of HIV in the highest and lowest sentinel states were inputted for the sample size calculation. A sample size of 376

subjects was determined to be required in order to detect an average minimum difference of 6.9% in the prevalence of HIV/AIDs between respondents in the states with highest and lowest sentinel sites (8.8% vs. 1.9%) at 95% confidence level and 80% statistical power. A loss rate of 15% to follow-up (e.g. non-participation and incomplete forms) was assumed to obtain a study sample size of 443 respondents.

3.4 Study population and sampling technique

The study population comprised pregnant women attending ANC in the selected health facilities as shown in table 2.1. A total of 443 women from 15 to 49 years in the reproductive age group who are attending ante natal clinic (ANC) in the selected facilities were identified and included in the study. Subjects were enlisted into the study as they come to clinic to access ANC. All available women within the sampling period were sampled in all study facilities. However women who were attending PMTCT clinics were excluded from the study. Efforts were made to include women who were attending ANC for booking or the first visit. Subjects in low prevalence states were compared with those from high prevalence states in the comparative study in relation to the HCT service uptake on the epidemiology of HIV in the states. The influence of variables such as the time of HCT uptake, proximity of residence to HCT centre, place of uptake, parity, age at first sexual act, location of health facility, referral source, use of condoms and number of sexual partners on the incidence of HIV in respondents were explored. Women attending ANC who gave their consent and were not attending PMTCT clinic were included in the study within the period allocated for data collection at the facilities in each selected site.

3.5 Instruments

Standardized questionnaires and laboratory templates (Appendix A) were used to elicit responses on the demographic profile such as level of education, occupation, marital status and type of marriage, parity, age, religion and ethnic group from subjects. The tool was also used to collect information on the socio-economic status of respondents, the life-style, sexual behaviour, knowledge, attitude and practices towards HIV/AIDS as well as time of HCT service uptake. In addition the study was also used to obtain the HIV status of respondents using a laboratory template. The laboratory tool was completed by an identified laboratory or Monitoring and Evaluation staff. The questionnaires were completed by nurses who were identified by The State SACA Project Managers of each study state. Unique numbers were assigned to each subject which was used to match information on laboratory templates with the questionnaire. This was to ensure that the identity of respondents was concealed and all information remained confidential.

3.6 Recruitment and training of data collectors

Data from each site was collected by a team of field personnel that comprised two data collectors (a nurse and a laboratory staff) and a field supervisor. Data from the laboratory was collected by the laboratory staff while the nurses administered the questionnaires on respondents. A two-day training workshop was conducted for all identified and qualified data collectors in Abuja. The data collectors and field supervisors received training on the study tools, SOPs, consent form and on interviewing techniques. In order to ensure a common knowledge of the tools by all data collectors before field work, the PI ensured that all the key terms and concepts contained in the SOPs and study guidelines were defined and operationalize Role plays and case scenarios were used as elements in the training to ensure that all trainees fully understood all aspects of the study tools and also to ensure that everyone involved in data collection gained a common and shared knowledge of the tools and field operations. The workshop afforded the data collectors and field supervisors the opportunity to ask questions. All issues raised were adequately clarified before the commencement of field work. Additionally, logistics and field operations were discussed at length at this meeting before deployment to field.

3.7 *Data quality assurance*

In order to assure quality of the data from the field, each team of data collectors in a state was supervised by a team leader. S/he ensured that the teams of data collectors followed the guidelines (SOP) for data collection on field. The team leader also checked and validated completed tools at the end of data

collection each day. S/he looked out for non responses, errors in completing the tools and omissions of data fields. S/he ensured that tools were filled adequately to eliminate missing values from the field as much as possible.

3.8 Pre-test of instruments

Additional measures to ensure the collection of good quality data from field included the piloting and standardization of all data collection tools on subjects in two selected facilities in the Lagos state. Issues such as typographic errors, ambiguous questions, omissions etc arising from the pilot test of instruments were highlighted and addressed. The pilot test of instruments also offered the opportunity to estimate the duration for administering each questionnaire on field. This was helpful for planning the actual field work.

3.9 Threats to validity and measures to mitigate expected threats

In order to ensure the internal and external validity of the findings of this study, random sampling techniques to select respondents from rural and urban facilities were employed. The techniques also ensured the selection of similar respondents into the study to avoid selection bias. The careful implementation of sampling techniques to select respondents would ensure the generalizability of findings among women and girls of reproductive age who are the most vulnerable yet hold the ace in the drive to achieving zero HIV infection among children and infants.

3.10 Study limitation

Only two health facilities are currently supported by Global Fund in Ekiti state. Both of which are located in an urban and a semi-urban location and were included in the study without random selection In addition it may be difficult to generalize the findings of this study to the general population that include men and other women outside the reproduction age bracket of 15 to 49 years of age.

3.11 Data management

Data collected was entered into a prepared data base, by trained and qualified data entry clerks. Five data entry clerks were recruited for data entry. They were given a half day orientation on the tools and how to enter the data into the data base. The data base was checked for data entry errors and consistencies in line with skip patterns in the tool. At the end of data entry, the data was edited, cleaned and stored in a secured data bank in readiness for analysis.

3.12 Statistical analysis

Before data analysis, the data was fully explored in order to gain knowledge of the nature of the data collected from field. Data analysis was performed in two steps to compare respondents who accessed HCT with those who did before and during pregnancy in high and low prevalence states.

Step 1: Frequency runs were performed to evaluate each variable in the study.

Step 2: Associations between respondents' characteristics and HCT uptake were estimated using GLM approach. Since the primary outcome variable in this study was binary (0= High prevalence; 1=Low prevalence), we assumed it had a binomial distribution. The analysis was carried out with generalised linear model with a logistic link.

The exponential family representation is $e^{\left[y\ln\left(\frac{p}{1-p}\right)-n\ln\left(\frac{1}{1-p}\right)\right]+\ln\binom{n}{y}}$.

The link function is $log\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 x_1 + \cdots + \beta_k x_k.$

Univariate Analysis – All variables were added in the model separately to detect the crude relationship with prevalence or risk status of respondents. Univariate modelling was performed as exploratory analysis to explain the distribution of respondents' general characteristics according to the prevalence of HIV in the states. Uni variate modelling was also performed on respondents' HIV risk and other perceived factors as mentioned earlier. This analysis was also performed to explain the proximity of HCT centers from respondents' residences in high and low prevalence states. Results reporting $p<0.05$ level were considered as strong evidence of robust effect.

Multivariate Analysis – Since all missing values were excluded, the degree of freedom only changed with the number of covariates. We assumed that the distribution and link function were correct. Analysis of deviance was employed to compare main effect model with nested models.

The main effects model included HCT up-take which was the main predictor variable in the analysis. The starting or main effect model gave the largest significant deviance. Other models were estimated with the same criteria until there was no significant decrease in the deviance. The potential confounding variables that were added were factors that showed statistical significance such as correct knowledge of HIV transmission, age at first sexual act and blood transfusion in the last one year were included in the analysis to model the HCT up-take and respondents' HIV risk in high and low prevalence states in the univariate analysis. Interaction between HCT up-take and reported cases of HIV in the study and other covariates were tested but no significant deviance decrease was detected. Results showing $p<0.05$ level were considered as strong evidence of robust effect. Model Evaluation ROC curve was used to diagnose the final model. Statistical calculation was carried out in STATA SE11.

IV. STUDIES AND FINDINGS

A total of 443 women attending ante-natal care (ANC) in 8 health facilities randomly selected from Benue, Akwa-Ibom, Kwara and Ekiti states were sampled in this study. The distribution of their general characteristics, risk factors, knowledge of HIV/AIDS and sexual behaviours were explored in line with the HIV prevalence in the respective states. The findings are presented in this report as follows.

4.1 Socio-Demographic Characteristics of Respondents

The social-demographic characteristics of study participants are presented in Table 4.1 below. About three-fifths of all respondents were sampled from low prevalence states of Kwara and Ekiti, while the rest were from Benue and Akwa-Ibom states. Similarly three fifths of all respondents fall within the 15 to 29 years age group. Additionally most respondents were in monogamous 349 (83.7%) marriage relationships and; live together 351 (80.9%) with their spouses in urban locations 306 (69.1%). Analysis also indicates that only 62 (14.0%) respondents attained graduate or post graduate level of education (Table 4.1).

Table 4.1 Socio-Demographic Characteristics of Respondents

Characteristics	Number	%
Prevalence		
High	182	41.1
Low	261	58.9
Age Group		
15 to 29	262	59.1
30 to 49	179	40.4
Location of Health facility		
Rural	132	30.9
Urban	306	69.1
Marital status		
Married	403	91.0
Single	19	4.3
Cohabiting partners	21	4.7
Type of marriage		
Monogamy	349	83.7
Polygamy	60	14.4
Cohabiting partners/Some form of relationship	8	1.9
Living arrangement		
Live together	351	80.9
Partner live in another part of town/city	35	8.0
Partner lives in another town/city	48	11.1
Level of education		
No schooling	41	9.3
Primary	76	17.2
Secondary/Technical college	151	34.2
OND/HND	111	25.2
Graduate/Post Graduate	62	14.0
Occupation		
Farming	38	8.9
Trading/Business	170	39.7
Civil servant	64	15.0
Artisan	65	15.2
Banker/Professional	18	4.2
Unemployed	72	16.8

4.2 *Univariate Modelling*

The exponential form of coefficients with 95% confidence interval and significance test are presented in Tables 4.2, 4.3 and 4.4 as results of univariate modelling. The results are presented as unit change of odds ratio compared with the respective reference groups in low prevalence states compared to high prevalence states.

4.2.1 Distribution of *Respondents' General Characteristics According To States' HIV Prevalence*

Those in the upper age bracket of 30 to 49 years of age were more likely to be in low prevalence states (Crude OR=2.777, 95%CI: 1.848, 4.175, p<0.001) compared to those in high prevalence states. There were also more cohabiting partners in the low prevalence states than states with high HIV prevalence states (p=0.010), however the majority of respondents in high and low prevalence states were married (92.9% vs 89.7%) respectively. Characteristics such as the living arrangements of partners and level of education were similar in both

low and high prevalence states except in the type of marriage. Analysis of the various types of marriages indicate that those in polygamous marriages were more likely to be in states with low HIV prevalence (Crude OR=4.184, 95% CI: 2.055, 8.568), p<0.001) than states with high prevalence states (Table 4.2). General Characteristics with Crude Odds/Ratios

Characteristics	High Prevalence states		Low Prevalence states		Crude Odds Ratio	95% CI		Sig.
Age Group	Number	%	Number	%				
15 to 29	133	73.1	129	49.4	1*			
30 to 49	49	26.9	132	50.6	2.777	1.848	4.175	<0.001
Location of Health facility								
Rural	61	33.5	76	29.1	1*			
Urban	121	66.5	185	70.9	1.227	0.816	1.844	0.325
Marital status								
Married	169	92.9	234	89.7	1*			
Single/Widowed	12	6.6	7	2.7	0.421	0.162	1.093	0.075
Cohabiting partners	1	0.5	20	7.6	14.443	1.92	108.67	0.01
Type of marriage								
Monogamy	159	90.9	190	78.5	1*			
Polygamy	10	5.7	50	20.7	4.184	2.055	8.568	<0.001
Cohabiting /some form of relationship	6	3.4	2	0.8	0.279	0.056	1.402	0.121
Living arrangement with partner								
Live together	143	79.9	208	81.6	1*			
Live in another part of town/city	12	6.7	19	7.4	1.088	0.512	2.312	0.825
Lives in another town/city	24	13.4	28	11	0.802	0.447	1.44	0.46
Level of education								
No schooling	16	8.8	25	9.6	1*			
Primary	42	23.2	34	13.1	0.518	0.239	1.123	0.096
Secondary/Technical college	59	32.6	93	35.8	1.009	0.497	2.042	0.981
OND/HND	40	22.1	71	27.3	1.136	0.543	2.375	0.735
Graduate/Post Graduate	24	13.3	37	14.2	0.987	0.439	2.2	0.994

1* refers to reference groups

4.2.2 Respondents Risk, Perceived Risk Factors and Behaviour in Prevalence States

Respondents who reported HIV positive status were less likely to be found in states with low HIV prevalence (Crude OR=0.355, 95%CI: 0.195, 0.646, p=0.001) compared with high prevalence States. Those who did not know someone with the HIV virus were more likely in low prevalence states (Crude OR=24.34, 95%CI: 2.817, 6.684; p<0.001) than high prevalence states. However, the majority of respondents in both low (98.9%) and high (98.3%) prevalence states have heard of HIV/AIDS. The majority of respondents heard of HIV/AIDS in high (39.2%) and low (65.9%) prevalence from health facilities. A higher proportion of these respondents were in low compared to high prevalence states. The proportion of respondents who reported hearing about HIV/AIDS from workshops/churches/schools is less than 6.0% in both high and low prevalence states (Figure 2.0). Surprisingly however, respondents who know only one or no correct mode of HIV transmission were likely to be in low than high prevalence states in the study, (Crude OR=9.250, 95%CI: 4.289, 19.950, p<0.001). About one tenth of respondents in both low and high prevalence areas did not know the mode of HIV transmission from mother to child; however the majority of respondents (84.8% vs 90.4%) in high and low prevalence states knew that HIV transmission from mother to child is preventable. Further analysis indicate that age at first sexual act is more likely to be delayed beyond 19 years in HIV low prevalence states (Crude OR=3.668, 95%CI: 2.461, 5.461, p<0.001) than in high prevalence states. Factors such as respondents' knowledge of HIV transmission from an infected mother to her child, condom use at first sexual act, injection use and awareness of HIV were similar in both high and low prevalence states and were not considered in the next level of analysis to adjust for the effect of HCT on the epidemiology of HIV in the states. However, Blood transfusion in respondents was less likely in low (Crude OR=0.463, 95%CI: 0.219, 0.975, p=0.043) than high prevalence states, while the up-take of HCT before current pregnancy was more likely in low HIV prevalence states (Crude OR=2.577, 95%CI: 1.653, 4.018, p<0.001) than high prevalence states as shown in Table 4.5. Higher proportions of respondents in low prevalence than high prevalence states accessed HCT before current pregnancy compared to those who never accessed HCT before current pregnancy in the study states (75.0% vs 53.8% and 46.2% vs 25.0%) respectively (Table 4.3).

Table 4.3 Risk Factors and Behaviour; Crude Odds Ratios

The Risk of HIV and Perceived Factor	High Prevalence states		Low Prevalence states		Crude Odds Ratio	95% CI		Sig.
Cases of HIV	Number	%	Number	%				
Positive	33	18.1	19	7.3	0.355	0.195	0.646	0.001
Negative	149	81.9	241	92.7	1*			
Know Someone with HIV								
Yes	87	49.1	47	18.2	1*			
No	90	50.9	211	81.8	4.34	2.817	6.686	<0.001
Ever Heard of HIV								
Yes	176	98.3	258	98.9	1*			
No	3	1.7	3	1.1	0.682	0.136	3.419	0.642
Respondents who know								
Three corr. modes of HIV Transmission	131	73.6	131	50.8	1*			
Two corr. modes of HIV Transmission	39	21.9	53	20.5	1.359	0.842	2.194	0.21
One or No corr. mode of HIV	8	4.5	74	28.7	9.25	4.289	19.95	<0.001
Knowledge of MTC Transmission of HIV								
Yes	146	89.6	201	87.0	1*			
No	17	10.4	30	13.0	1.282	0.681	2.412	0.441
Know that Trans. to newborn is preventable								
Yes	151	84.8	234	90.4	1*			
No	27	15.2	25	9.6	0.597	0.334	1.068	0.082
Age at First Sexual Act								
≤ 19.0 Years	111	61	78	29.9	1*			
> 19.0 Years	71	39	183	70.1	3.668	2.461	5.465	<0.001
Condom at First Sexual Act								
Yes	57	32.2	79	30.7	1*			
No	120	67.8	178	69.3	1.07	0.709	1.616	0.747
Blood Transfused in last one Year								
Yes	10	5.7	29	11.5	2.162	1.025	4.56	0.043
No	167	94.3	224	88.5	1*			
Had Injection in the last one Year								
Yes	81	45.3	130	51.6	1*			
No	98	54.7	122	48.4	0.776	0.528	1.139	0.195
HCT Up-take								
Never	61	46.2	64	25	1*			
Before current Pregnancy	71	53.8	192	75	2.577	1.653	4.018	<0.001

1* refers to reference group.

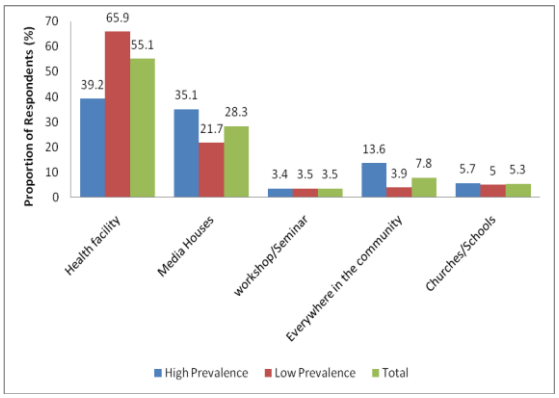


Figure 2.0 showing respondents' sources of HIV/AIDS information

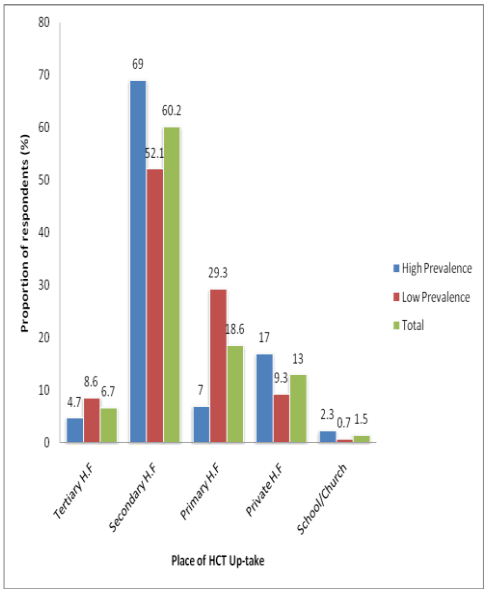


Figure 3.0 showing the proportion of respondents' place of HCT up-take

The majority of respondents in high and low prevalence areas accessed HCT in secondary health facilities (Figure 3.0). While HCT services were rarely accessed in public places such as worship centers and schools in both high and low prevalence states. Furthermore the majority of respondents were counseled, tested for HIV and got their test results (92.4%), however more respondents in low prevalence states accessed HCT and got their results than respondents in High prevalence states (Figure 4.0). Respondents reasons for not accessing HCT before current pregnancy included; "I am afraid to know my HIV status"(18.1%), "I do not know where to test" (5.4%), "My spouse already tested" (2.0%), "I am too busy or I am sure of of myself" (22.1%). Over half of the respondents who did not access HCT before current pregnancy had "No reason" for failing to access the service (Figure 5.0).

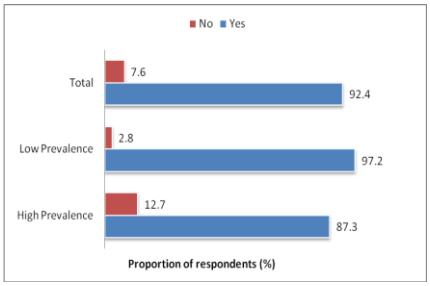


Figure 4.0 The proportion of respondents who accessed HCT services and got their test results

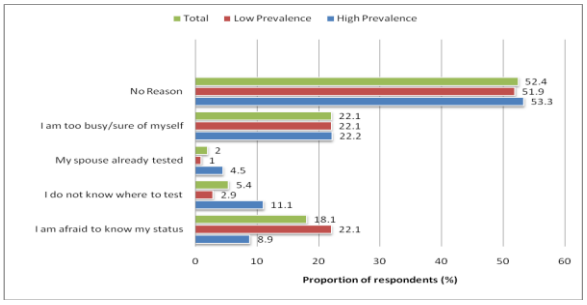


Figure 5.0 Respondents reasons for not accessing HCT services prior to Attending ANC

4.2.3 Accessibility of HCT centers to respondents

Table 4.4 presents the distribution of respondents in high and low HIV prevalence states according to their accessibility of HCT centers as well as their family's ownership of vehicles. Results reveal that respondents in low prevalence states were more likely to have residences between 5 to 10 minutes walking distances to HCT centers compared to respondents in high prevalence states (Crude OR=7.137, 95%CI:2.337, 21.800. p=0.001) and (Crude OR=2.483, 95%CI: 1.335, 4.616. p=0.004). Respondents' family ownership of vehicles and the motorability of the roads from respondents' residence to HCT centers were not important factors associated with the prevalence of HIV in the states.

Table 4.4 Accessibility of HCT centres; Crude Odds Ratios

Accessibility of HCT centres and Ownership of vehicles	High Prevalence states		Low Prevalence states		Crude Odds Ratio	95% CI		Sig.
	Number	%	Number	%				
Nearness of HCT centres to Residence								
Over 1 hour walk	52	29.4	51	19.6	1*			
1 hour walk	48	27	43	16.5	0.913	0.519	1.606	0.753
30 Minutes walk	50	28.3	82	31.5	1.672	0.992	2.819	0.053
10 minutes walk	23	13	56	21.6	2.483	1.335	4.616	0.004
5 minutes walk	4	2.3	28	10.8	7.137	2.337	21.800	0.001
Is road from residence to HCT centres Motorable?								
Yes	172	98.3	244	95.3	1*			
No	3	1.7	12	4.7	2.82	0.784	10.143	0.112
Family's ownership of vehicles								
Bicycle	11	6.3	19	7.4	1*			
Motorcycle	76	43.2	136	53.1	1.036	0.468	2.292	0.930
Car/Truck	73	41.4	88	34.4	0.698	0.312	1.561	0.381
None	16	9.1	13	5.1	0.47	0.166	1.334	0.156

1* refers to the reference groups.

4.3 Multivariate Analysis

The estimates of the final model are presented in Table 4.5 as adjusted odds ratios compared with the reference groups in low and high prevalence states. Results indicate that the probability of the Up-take of HCT before current pregnancy in respondents was more likely in low prevalence states (Adjusted OR=2.815, 95%CI: 1.675, 4.731, p<0.001) than in high prevalence states. The result indicates that a statistically significant association exist between the up-take of HCT and the epidemiology of HIV in the states according to prevalence rates of HIV. The Null hypothesis of no difference in HCT up-take in the study was thus rejected and the alternate hypothesis of a difference in the up-take of HCT in high and low prevalence states was accepted.

Table 4.5 Adjusted Odds Ratios

The Risk of HIV and Perceived Factor	High Prevalence states		Low Prevalence states		Crude Odds Ratio	95% CI		Sig.
HCT up-take	Number	%	Number	%				
Never	61	46.2	64	25	1*			
During current Pregnancy	71	53.8	192	75	2.815	1.675	4.731	<0.001
Respondents who know								
Three corr. modes of HIV Transmission	131	73.6	131	50.8	1*			
Two corr. modes of HIV Transmission	39	21.9	53	20.5	2.148	1.171	3.941	0.013
One or No corr. mode of HIV	8	4.5	74	28.7	9.508	3.963	22.811	<0.001
Age at First Sexual Act								
≤ 19.0 Years	111	61	78	29.9	1*			
> 19.0 Years	71	39	183	70.1	4.805	2.883	8.011	<0.001
Blood Transfused in last one Year								
Yes	10	5.7	27	11.5	2.472	0.973	6.282	0.057
No	167	94.3	224	88.5	1*			

1* refers to reference group.

Surprisingly results suggest that respondents who knew only two correct modes of HIV transmission were more likely to be in low prevalence states (Adjusted OR=2.148, 95% CI: 1.171, 3.941, p=0.013) compared to high prevalence states. The results further suggest that respondents who know only one or no correct mode of HIV transmission were more likely (adjusted OR=9.508, 95%CI: 3.963, 22.811, p<0.001) to be found in states with low than high prevalence. However analysis reveal that age at first sexual initiation was significantly delayed beyond 19 years of age in states with low HIV prevalence (Adjusted OR=4.805, 95%CI: 2.883, 8.011, p<0.001) than in states with high prevalence. Blood transfusion in the prevalence states turned up to be similar in the modelling analysis.

V. DISCUSSION OF RESULTS

Some factors including respondents' knowledge of correct modes of HIV transmission, age at first sexual act, and blood transfusion in the last one year were included in the main effect model to adjust for the effect of HCT up-take on HIV prevalence in the states included in the study. The model fit indicated the age at first sexual act as the most important risk factor for HIV infection in the states. The study found an association between HCT up-take before current pregnancy in the prevalence states to be statistical significant. This indicates that the up-take of HCT before pregnancy has probable benefit for women in their reproductive age. The study also reveals that HCT centers in low prevalence states

were within 5 to 10 minutes walking distances from respondents' residences compared to high prevalence states. The close proximity to HCT centres could help to increase service up-take among respondents in low prevalence states. The strategies to improve access to HCT services have been found to be effective in reducing the high prevalence of HIV in some settings. This was supported by the finding from a study conducted in Uganda where HCT services were offered to patients in high epidemic area through provider-initiated HCT offered at health clinic and hospitals as well as mobile HCT services offered to homes and communities [21]. These strategies are known to be affected by available resources; however it helps in expanding the knowledge of HIV status in the community, by identifying individuals who are infected to be directed to receive treatment and counsel those negative to stay negative, thereby reducing the epidemic [22]. Expanding HCT knowledge can be achieved by scaling up access to the services in under-served and rural communities; Mobile HCT services were offered as conventional stand-alone HCT strategy [23] through free standing centers, offering HCT services to client's homes, and communities [24] to ensure all community members have access to the services. Individuals attending the centers were initiated through awareness campaigns and were offered group counselling with key messages delivered to them after informed consent was obtained. Clients with HIV positive results were referred to health clinics for follow-up [25]. Hospital or clinic based HCT was offered to all patients attending hospital, clinic or health centre irrespective of illness presented for treatment with an opt-out method [26]. Counselling is provided prior to testing with key messages after informed consent are obtained in private meeting. Similarly, Tanzania has adopted the increased coverage, quality and the utilization of HIV prevention services such as HCT services as a key strategy to drastically reduce the incidence of HIV in the country. Preliminary reports indicate some promise of positive indications of reduction of HIV infection in some communities according to a recent report [7]. The impact of HCT however depends on the linkages to prevention, treatment, care and support services (WHO, 2013).

Furthermore a WHO web report [27] suggests that through voluntary HIV counselling, expanded treatment of STIs, awareness of campaigns and community mobilization encouraging delayed initiation of sexual activity , monogamy and use of condoms , the level of infection declined significantly since 1992 from 30% to 11.2% in prenatal settings in Kampala and 13% to 5.9% in clinics outside major urban areas. The report also stated that since women in Sub-Saharan Africa are the hardest hit by the epidemic, the majority of transmission stems from sexual behaviour. This is in consonance with the finding of this study indicating that delay in initiation of sexual activity in young people could be helpful in preventing new infections and curb the epidemiology of HIV in vulnerable individuals and communities. It is also important to note that findings in this study suggest that more respondents in low prevalence states were more likely to know only two, one or no correct mode of HIV transmission compared to those in high prevalence states, who were more likely to know 3 correct modes of HIV. This is the current situation of respondents in high prevalence states and may have been engendered by the ravages of the epidemics and the aggressive implementation of preventive measures in response to HIV epidemic in the affected states. It appears however that the higher knowledge of HIV transmission in high HIV prevalence states is undermined by the early initiation of sexual activities. The result is also worrisome for low HIV prevalence states as the tide in prevalence may shift towards these states due to lack of adequate knowledge of the transmission of HIV in affected state states.

The strength of the study is that participants were drawn from rural and urban locations with a fair distribution across respondents' socio-demographic characteristics. This similarity of respondents minimized selection bias in the study and allows for the generalizability of findings among women and girls of reproductive age. The study was limited to women and girls attending ANC and by this excludes other women who do not attend ANC. Furthermore it excludes the male population and other women outside the reproductive age. This makes it difficult to generalize the study to the whole population however it could serve as a proxy to gain insight into the situation in the general population. Further studies could be conducted to explore other reasons for higher up-take of HCT in low prevalence states

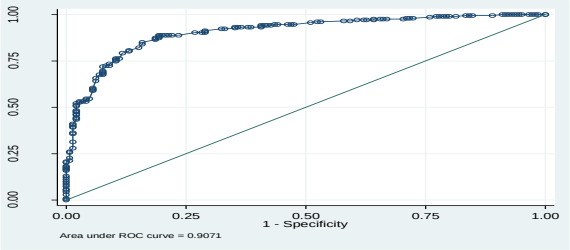
apart from the proximity of HCT centers to respondents in those areas. *Challenges and lessons learn*

The cooperation received from the health facilities varied widely. Where support was received from the management of health facility the outcome of field work was usually satisfactory. There were few occasions where data collection was hampered because the designated staff did not receive the support of superiors. Data collectors influenced responses in some cases. Studies in Kaima Health Centre and Civil Service Hospital in Kwara state were canceled when this was discovered. These facilities were replaced consequently and this added more constraint on our time and available resources.

VI. CONCLUSION AND RECOMMENDATIONS

This study reveals that age at first sexual activity was the most important risk factor for HIV infection in the prevalence states. A delay in the initiation of early sexual activities could prevent new infection in young people and reduce the HIV epidemic even in high risk areas. In addition, association between the HCT up-take before current pregnancy in the prevalence states was statistical significant and has benefit for women because of its potential to reduce the risk of HIV infection. In this regard we suggest that HCT services should be expanded beyond health facilities to worship places, schools and other public places to ensure that people have access to services within their reach. Mobile HCT services could also be provided in communities and towns to ensure that everyone has access to the service. The campaign to encourage young people to delay the initiation of sexual activity could also be very helpful in the effort to prevent new HIV infections. Additionally the campaign against HIV/AIDS should be sustained both in urban and rural areas as well as in high and low prevalence states because misconceptions about HIV/AIDS still exist out there. It is important that people, particularly women endeavour to ascertain their HIV status so as to further enhance their ability to protect themselves and the new born from HIV infection.

Appendix : Model Evaluation



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