



EFFECT OF DIFFERENTIATED SERVICE DELIVERY MODEL ON PRECONCEPTION AND ANTENATAL CARE AMONG WOMEN LIVING WITH HIV IN WESTERN KENYA

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ABSTRACT

The differentiated care model (differentiated service delivery), is a client-centered strategy that streamlines and customizes HIV services throughout the clinical cascade. Differentiated service delivery captures the desires and aspirations of different populations of HIV-positive people. Since its introduction, women of reproductive age enrolled in care have had one-on-one clinical reviews at most twice in a year. This, however, varies their use of various sexual and reproductive health services like contraception, pregnancy intention assessment, and antenatal clinic attendance, since sexual and reproductive health services are not incorporated in this model. We investigated the effect of differentiated care on preconception and antenatal care among women of reproductive age living with HIV and receiving antiretroviral treatment in Kisumu County. Data from 369 patient records at the comprehensive care and antenatal care clinics of the county's four primary healthcare facilities was retrieved for this retrospective longitudinal study. Data analysis was done on SPSS (v. 23) using descriptive and inferential statistics ($\alpha = 0.05$). Differentiated service delivery had an impact on pregnancy intention, as those who went for an ART refill after 6 months were 0.45 times less likely to intend pregnancy compared to those who went after 3 months (OR = 0.45, 95% CI 0.26-0.77, $p = 0.003$). Facility-based clients were 1.44 times more likely to get preconception care than those who were community-based (OR 1.44, 95% CI 1.2-2.98, $p = 0.043$). Having sessions led by a nurse or a clinical officer raised the likelihood of partner involvement during ANC by 2.41 (OR 2.41, 95% CI 1.16-6.06, $p = 0.025$) and 3.96 (OR 3.96, 95% CI 1.42-11.01, $p = 0.008$) times, respectively, compared to those led by a community health worker. Women who returned for Anti Retro Viral Therapy refill after 6 months were less likely to have good focused antenatal care uptake than those who returned every 3 months (OR, 0.49, 95% CI, 0.29-0.8, $p = 0.012$). Differentiated care affects pregnancy intention, preconception care, partner involvement, and focused antenatal uptake. The Ministry of Health should include mechanisms that promote pregnancy intention and ensure sufficient preconception care for both stable and unstable clients, and for facility-based and community-based clients.

Key words: differentiated, model, preconception, women, western Kenya

I. INTRODUCTION

Differentiated care (DC), also known as differentiated service delivery (DSD), is an approach that is client-centered and simplifies and adapts HIV services across the clinical cascade. It reflects the preferences and expectations of different categories of people living with HIV (PLHIV). As a result, the

health system's heavy workload is lessened, allowing resources to be allocated to those who most need them. Differentiated care is increasingly being touted as a potential solution to address and enhance HIV prevention, care, and treatment access, quality, and efficiency. (Ehrenkranz et al., 2019; Grimsrud et al., 2016).

The WHO recommendations for HIV prevention and treatment advocate for the DSD (WHO, 2016a). DSD has been included

into national guidelines in various Sub-Saharan African countries, including Zimbabwe, South Africa, and Swaziland (Bemelmans *et al.*, 2014; Grimsrud *et al.*, 2016). International donors, particularly PEPFAR and the Global Fund, are encouraging the use of DSD models in a number of countries, including Kenya. This is accomplished, in part, by targeted support for the implementation of reduced frequency of clinic visits and lengthier ART refills, often known as multi-month prescribing (Adjetej *et al.*, 2019; Hagey *et al.*, 2018; Roy *et al.*, 2019).

This public health approach answers the increasing variation of PLHIV needs especially among the women (McNairy *et al.*, 2015). The DSD model intentionally targets the traditional public health response at a demographic group or geography in a way that responds to the needs of the women receiving the services by building on the foundation of interventions, such as decentralization, task sharing, integration, multi-month prescriptions, and peer support (Ehrenkranz *et al.*, 2018; Roy *et al.*, 2019). This is in contrast to typical clinic visits, where clients queue to see clinicians for ARV prescriptions and then queue again at the pharmacy to pick up the ARVs each month. While this approach can be applied across the spectrum of HIV services—from prevention to detection to viral suppression—differentiated ART delivery targets the treatment needs of women living with HIV who are on lifelong ART (Ehrenkranz *et al.*, 2018).

To ensure the best possible health for mother and child during pregnancy and at the time of delivery, health care professionals provide pregnant women with antenatal care (ANC), which includes risk assessment, disease prevention and management, health promotion, and education about pregnancy-related risks (Myer *et al.*, 2017). Focused antenatal care (FANC) is a type of tailored care that is goal-oriented and focuses the client's rights, birth readiness, and management of issues associated with pregnancy. It requires a minimum of four clinic visits. FANC focuses on ANC visits with targeted assessments of expectant mothers to identify and treat diseases that are already present, detect complications and other potential issues that may affect the outcome of the pregnancy, and provide prophylaxis and treatment for anemia, malaria, and sexually transmitted infections (STIs), including HIV, urinary tract infections, and tetanus (Ayalew & Nigatu, 2018; Chama-Chiliba & Koch, 2015; Gebretsadik *et al.*, 2019; Woyessa & Ahmed, 2019).

Additionally, FANC aims to provide pregnant women with holistic, individualized care to support the continuation of their pregnancy's normal course by providing timely guidance and counseling, focusing primarily on individual birth plans, nutritional checks, immunizations, hygiene, and family planning, as well as sensitization on danger symptoms that indicate the pregnant woman should seek immediate medical attention (Asah-Opoku *et al.*, 2019; Desalegn *et al.*, 2016). The WHO suggests four focused ANC visits throughout pregnancy to accomplish this. The first appointment is scheduled for 8 to 12 weeks, followed by visits two and three at 24 to 26 weeks,

36 weeks, and 36 to 38 weeks, respectively (Ashraf *et al.*, 2017; McHenga *et al.*, 2019).

Studies have shown that the implementation of DSD in Kisumu County has improved access to preconception and antepartum care for women living with HIV. DSD has enabled healthcare providers to deliver services in a more patient-centered and culturally appropriate manner, improving patient satisfaction and adherence to treatment regimens. Additionally, DSD has improved the uptake of HIV testing and counseling, family planning services, and antiretroviral therapy.

However, the effectiveness of DSD in improving preconception and antepartum care for women living with HIV in Kisumu County has been limited by a number of factors, including limited resources, weak healthcare systems, and inadequate support for community-based organizations. Additionally, the persistence of stigma and discrimination against people living with HIV has also contributed to barriers to access to care.

II. METHODS

A. Study design

This cross-sectional study involved data abstraction from patient records from 4 major public health facilities in Kisumu County to help understand the impact of differentiated service delivery on the care given to pregnant women on antiretroviral therapy.

B. Study area

Kisumu is one of the counties of western Kenya, bordering the counties of Nandi to the North East, Vihiga to the North West, Homa Bay to the south, Siaya to the West, and Kericho to the east (County Assembly of Kisumu, 2019). The county covers a total area of about 2,496.1 km². 120 of the 149 healthcare facilities in the county's seven sub counties are public facilities. One county referral hospital, six sub-county hospitals, and 113 primary care facilities make up the 120 public facilities. The county's 187 currently operating Community Health Units also provide health services, in addition to the medical institutions. A nurse to population ratio of 1:1697 and a doctor to population ratio of 1:3851 indicate the county's current health care staffing levels. Comprehensive Care Clinics at the Rabuor Sub County Hospital, Pap Onditi, Muhoroni Sub County Hospital, and Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH) were used for this study. As sub county referral centers, these hospitals are high volume healthcare facilities with a high HIV prevalence. Based on the WHO clinical recommendations and the Kenya National ART guidelines, these facilities provide stable customers with unique care services.

C. Study population

The study population was women in the reproductive age (15 to 49 years). A report by Kenya National Bureau of Statistics projects that there are 466,535 women in the reproductive age in Kisumu (De Cock et al, 2014). One in every four residents of Kisumu has HIV, according to city records (Prevalence of 24.8%, Kenya HIV Estimates, 2015). This is much more prevalent in women (26.4%) than in men (22.8%).

D. Target population

This study focused on HIV-positive women between the ages of 15 and 49 who were aware of their infection status, receiving lifetime ART for more than 12 months, using the DSD model, and who were deemed stable by the WHO and Kenya National Clinical Guidelines on ART within Pap Onditi, Muhoroni Sub County Hospital, Rabuor Sub-County Hospital, and Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH).

E. Sample size determination

The minimum required sample size for the study was determined using Cochran (1977) formula:

$$n = \frac{Z^2 pq}{e^2}$$

Where:

n = sample size

Z= z-score at confidence level of 95% (1.96)

p=estimated prevalence of unintended pregnancy in Kenya, 0.4 (Mumah et al., 2014)

q=1-p (0.6) e=margin of error (5%)

Substituting: **n = 369**

F. Sampling procedure

The study therefore analyzed data for 369 women of reproductive health enrolled on the DSD in Kisumu County. To calculate for the sample per facility, proportionate sampling was done because JOOTRH is the largest and operates at a much higher capacity, so was proportionately contribute 40% of the participants while the other 3 facilities 20% each, as shown on Table 1.

Table 1: Participant distribution by facility

Facility	n	%
JOOTRH	147	39.84
Pap Onditi	74	20.05
Muhoroni	74	20.05
Rabuor	74	20.05
Total	369	100

For this investigation, the preferred sample method was consecutive sampling. All WRAs who became pregnant while taking DSD were sequentially enrolled in the trial until the necessary number of participants was reached. The study's facilities - Pap Onditi, Muhoroni Sub County Hospital, Rabuor Sub County Hospital, and Jaramogi Oginga Odinga Teaching and Referral Hospital (JOOTRH) – were purposely sampled owing to their existing HIV interventions and relatively high patients enrollment. All WRA who were enrolled on ART at each site between January 2018 and December 2020 were sampled, with a 12-month follow-up after enrollment.

G. Inclusion and exclusion criteria

Patient records were retrieved only for women aged 15 years and over, and enrolled on care between January 2018 and December 2020, and who were not lost to follow-up for at least 12 months. However, women who met this criterion, but had a recorded condition contraindicating a pregnancy were excluded in the study.

H. Data collection

Data extraction was done using a predesigned form, and in a manner that ensures confidentiality, primarily within the CCC or ANC, in a private room. Data was extracted from three different sources: ANC Register (MOH 405), the pregnancy assessment, pregnancy intention and contraceptive use tool, and the ART monthly register. The data extraction was mainly done with assistance of the facility-based health record and information officers with qualification on health records and information management as well as skill and experience in data privacy. The extraction process, the extractors were trained on the extraction process, client data privacy and consenting processes. The data extracted from the MOH and facility tools were cross checked by the supervisor on daily basis for validity and consistency. The data was reliable owing to the credibility of the data sources, utilization of qualified data extractors and supervisor. The data was also thoroughly cleaned physically for any anomalies and inconsistencies .

I. Data analysis

Daily data forms verification for completeness was done as well as coding and data compilation in an Excel database. After all the data had been entered into the database and the database cleaned, it was exported to SPSS version 23 for analysis. Descriptive statistics, particularly proportions and frequencies, were used to summarize the data from categorical variables, whereas continuous variables like age were summarized using the format mean +/- standard deviation. Logistic regression model was used to determine the association between the predictor factors and the outcome variable since the outcome data collected was categorical or binary ($\alpha = 0.05$).

J. Ethical considerations

Approval for this study was sought from the Board of Postgraduate Studies, Jaramogi Oginga Odinga University of Science and Technology. Ethical clearance was obtained from NACOSTI and Jaramogi Oginga Odinga Teaching and Referral Hospital Ethics Review Committee, and permission to access hospital records was obtained from Ministry of Health in Kisumu County and the management of the facilities involved: JOOTRH, Pap Onditi Sub County Hospital, Muhoroni Sub County Hospital, and Rabuor Sub County Hospital. All research materials were secured in locked cabinets with keys kept by the researcher, with extremely limited access. To safeguard patient identity, unique codes (completely unrelated to the existing codes in hospital records) were assigned by the researcher at the time of data collection, and decoding was only done by one data analyst. The patients were effectively briefed on voluntary participation to the study, consenting and voluntary withdrawal from the study at any point that they feel uncomfortable. All data was entered and stored on password-protected computers with very limited access. Publications and other dissemination materials did not bear any information that might reveal the identity of the participants.

III. RESULTS

Respondent characteristics

The purpose of this section is to reveal the effects of the differentiated care model on preconception and antenatal care among women of childbearing age receiving ART in Kisumu County. It does this by presenting the results on the background of the 369 women whose data was abstracted during this study. Up to 147 (40%) of the women were from JOOTRH, and Pap Onditi, Muhoroni and Rabuor each contributed 74 (20%) participants. This is because JOOTRH had many more participants since it is the largest referral facility and serve the members of Kisumu, Vihiga, Kakamega, Homabay, and counties (Table 2).

Table 2: Participants distribution by facility

Facility	N	%
JOOTRH	147	39.84
Pap Onditi	74	20.05
Muhoroni	74	20.05
Rabuor	74	20.05
Total	369	100.00

Nearly half of the participants were aged below 30 years, the predominant age group being 25-30 years (n=102; 27.6%), while only 21.1% were aged ≥41 years (Table 3).

Table 3: Age of the Participants

Age (years)	Frequency	%
19-25	77	20.9
26-30	102	27.6
31-35	63	17.1
36-40	49	13.3
41-45	41	11.1
46-49	37	10.0
Total	369	100.0

A moderate number of the participants (n=121; 32.8%) had their highest level of education as primary and below; followed by secondary (n=103; 27.9%), tertiary (n=91; 24.7%), and university (n=54; 14.6%) education (Table 4.3).

From the results, most (62.60%) of the 369 participants were using contraceptives, with injections being the most used contraceptives, accounting for 124 (33.6%), followed by oral and implants each accounting for 46 (12.47%).

Analysis on pregnancy intention indicated that 342 (93%) of the respondents confirmed that the pregnancy was not intentional, although 367 (99%) participants had a PMTCT/safe pregnancy. Moreover, analysis of ANC attendance showed dismal uptake of the services, with only 59 (15.99%) having completed 4 ANC visits as per schedule. Only 23 (6.23%) attended first ANC at First gestation, 137 (37%) attended first ANC at Second trimester, 124 (33.60%) attended first ANC at third trimester while 79 (21.41%) had their first visit at Fourth trimester. Those who did not attend ANC at all accounted for 5 (1.36%). Only 269 (73%) respondents had pregnancy assessment before DSD, compared to 2 (0.54%) who had pregnancy assessment after DSD, while 367 (99.46%) were not assessed. On partner involvement, only 52 (14%) had their partners involved during pregnancy.

Effect of Differentiated care on pregnancy intention among WRA taking ARVs

This study findings as shown in Table 4.5 below show that the participants who had their sessions led by patients, peers or family were 0.31 times lower chances of intending pregnancy in comparison to those who had their sessions led by a community health worker (COR = 0.31, 95% CI 0.16-0.59, $p < 0.001$) on multivariate logistic regression the study revealed that the participants who had their sessions led by nurse and pharmacists were more likely to intend pregnancy as compared to those who had their sessions led by a community health worker with the findings as (AOR = 2.28, 95% CI 2.08-5.98, $p < 0.047$) and (AOR = 1.42, 95% CI 1.24-2.65, $p < 0.003$) respectively. (AOR = 0.33, 95% CI (0.13-0.84)0.019 Those who never had good adherence were at lower possibility of intending pregnancy in comparison to those who had good

adherence (COR = 0.49, 95% CI 0.25-0.94, $p = 0.033$). Another finding was that those who went for ART refill after 6 months were 0.45 times less chances of intending pregnancy in comparison to those who went for ART refill after every three months (COR= 0.45, 95% CI 0.26-0.77, $p=0.003$). Looking at the particular role of the differentiated care model based on location, the study revealed that the participants who were facility-based were 1.32 times possibility of intending pregnancy in comparison to those who were community-based (COR;1.32, 95% CI (1.17-2.59), $p < 0.001$). Considering multivariate logistic regression, the study revealed that those who had opportunistic infections were less likely to intend pregnancy as compared to those who did not have (AOR;0.33, 95% CI (0.13-0.84), $p= 0.019$), on the same it was realized that the individuals who had their ART refilled had a higher

intention of getting pregnant as compared to those who didn't refill their ART (AOR;1.32, 95% CI (1.16-3.63), $p=0.001$). The ones who used contraceptives had less chances of intending pregnancy in comparison to those who never used contraceptives (COR= 0.26, 95% CI 0.14-0.49, $p < 0.001$). this was also realized in multivariate analysis where by those who used contraceptives had less chances of intending pregnancy in comparison to those who never used contraceptives (AOR;0.23, 95% CI (0.10-0.52), $p<0.001$). Furthermore, participants who used intrauterine devices (IUDs) and oral contraceptives had less chances of intending pregnancy in comparison to those who used condoms (COR = 0.33, 95% CI 0.34-0.74, $p < 0.001$) and (COR = 0.17, 95% CI 0.49-0.54, $p = 0.012$), respectively (Table 4).

Table 4: Effect of DSD on pregnancy intention among WRA taking ARVs

Variables	n (%)	COR (95% CI)	P-value	AOR (95% CI)	P-value
DSD session lead					
Community health worker	124(33.6)	Ref		Ref	
Patient, peers, family	118(31.98)	0.31(0.16-0.59)	<0.001	0.53(0.23-1.21)	0.132
Nurse	64(17.34)	0.82(0.42-1.59)	0.561	2.28(2.08-5.98)	0.047
Pharmacist	18(4.88)	0.42(0.11-1.53)	0.189	1.42(1.24-2.65)	0.003
Medical officer	23(6.23)	1.35(0.54-3.38)	0.522	0.25(0.03-1.96)	0.186
Clinical officer	22(5.96)	0.33(0.09-1.19)	0.09	0.31(0.04-2.49)	0.271
ART Adherence					
Good	288(78.05)	Ref		Ref	
Not Good	81(21.95)	0.49(0.25-0.94)	0.033	0.76(0.22-2.58)	0.657
Refill frequency					
Every 3 months	227(61.52)	Ref		Ref	
Every 6 months	142(38.48)	0.45(0.26-0.77)	0.003	0.96(0.5-1.83)	0.903
DC model					
Community Based	142(38.48)	Ref		Ref	
Facility Based	133(36.04)	1.32(1.17-2.59)	<0.001	0.48(0.22-1.06)	0.071
Fast Track	94(25.47)	1.82(0.46-4.46)	0.509	0.9(0.43-1.91)	0.79
Psychosocial support					
No	95(25.75)	Ref		Ref	
Yes	274(74.25)	1.05(0.61-1.83)	0.855	1.09(0.53-2.24)	0.824
Opportunistic infection					
No	82(22.22)	Ref		Ref	
Yes	287(77.78)	1.52(0.82-2.83)	0.183	0.33(0.13-0.84)	0.019
Viral load test					
No	73(19.78)	Ref		Ref	
Yes	296(80.22)	1.04(0.57-1.9)	0.900	0.62(0.24-1.6)	0.32
Clinical monitoring					
No	72(19.51)	Ref		Ref	
Yes	297(80.49)	1.12(0.61-2.07)	0.718	0.46(0.23-1.91)	0.261

ART refill					
No	102(27.64)	Ref		Ref	
Yes	267(72.36)	1.52(0.86-2.69)	0.148	1.32(1.16-3.63)	0.001
Contraceptive use					
No	104(28.18)	Ref		Ref	
Yes	265(71.82)	0.26(0.14-0.49)	<0.001	0.23(0.10-0.52)	<0.001
Types of the Contraceptives					
Condom	83(31.32)	Ref		Ref	
Implant	87(32.83)	0.71(0.15-3.25)	0.654	0.71(0.15-3.25)	0.655
Injection	49(18.49)	0.41(0.04-3.79)	0.433	0.41(0.04-3.82)	0.437
Intrauterine Device (IUD)	7(2.64)	0.33(0.34-0.74)	<0.001	0.87(0.3-2.36)	0.451
Lactation amenorrhea	18(6.79)	0.95(0.8-11.48)	0.092	0.74(0.82-9.03)	0.087
Oral	21(7.92)	0.17(0.49-0.54)	0.012	0.51(0.14-2.48)	0.611

Effect of differentiated care on preconception care

From Table 5, the participants who had their sessions led by a nurse had 2.06 times possibility of attending pre-conception care in comparison to those who were led by a community health worker (COR 2.06, 95% CI 1.07-2.19, $p = 0.033$). On the other hand, those sessions led by a clinical officer had their clients 6.5 times possibility of attending pre-conception care in comparison to the respondents who had their sessions led by community health worker (COR 6.5, 95% CI 2.28-18.49, $p < 0.001$). On ART adherence in multivariate analysis, it was revealed that the participants who adhered to ART were less likely to have preconception care as compared to those who didn't (AOR 0.48, 95% CI (0.24-0.93), $p=0.031$). Considering differentiated care model, the participants who were at facility-based had 1.44 times chances to have preconception care in comparison to those who were community-based

(COR 1.44, 95% CI 1.2-2.98, $p = 0.043$). Findings also revealed that the clients who had taken a Viral load test had higher intention to attend pre-conception care in relation to those who had not gone for the test (COR 2.27, 95% CI 1.14-6.53, $p < 0.001$), as was also discovered in those who had been in clinical monitoring (COR 1.43, 95% CI 1.22-2.84, $p = 0.015$) and those who had their ART refill, with the, and COR; 1.25, 95% CI 1.13-2.47, $p < 0.001$). On contraceptive types, the participants who indicated having been using implants had higher chances of attending pre-conception care in comparison to those using condom (COR 1.23, 95% CI 1.10-2.51, $p < 0.001$), this was also realized in the multivariate analysis whereby the participants who indicated having been using implants had higher chances of attending pre-conception care in comparison to those using condom (AOR; 1.26, 95% CI (1.17-2.63), $p < 0.001$).

Table 5: Effect of differentiated care on pre-conception care

Variables	N (%)	COR (95% CI)	P-Value	AOR (95% CI)	P-value
DSD session lead					
Community health worker	124(33.6)	Ref		Ref	
Patient, peers, family	118(31.98)	0.48(0.22-1.08)	0.075	0.98(0.13-7.34)	0.984
Nurse	64(17.34)	2.06(1.07-3.19)	0.033	0.35(0.06-2.03)	0.239
Pharmacist	18(4.88)	6.5(2.28-18.49)	<0.001	0.17(0.02-1.43)	0.104
Medical officer	23(6.23)	0.24(0.03-1.86)	0.17	1.65(0.47-5.78)	0.435
Clinical officer	22(5.96)	0.25(0.03-1.95)	0.185	0.27(0.05-1.41)	0.12
ART Adherence					
Good	288(78.05)	Ref		Ref	
Not Good	81(21.95)	1.17(0.57-2.43)	0.667	0.48(0.24-0.93)	0.031
Refill frequency					
Every 3 months	227(61.52)	Ref		Ref	
Every 6 months	142(38.48)	0.97(0.51-1.84)	0.917	0.44(0.26-3.76)	0.303

DC model						
Community Based	142(38.48)	Ref		Ref		
Facility Based	133(36.04)	1.44(1.20-2.98)	0.043	0.31(0.05-2.09)		0.230
Fast Track	94(25.47)	0.88(0.42-1.84)	0.725	2.41(0.46-12.63)		0.299
Psychosocial support						
No	95(25.75)	Ref		Ref		
Yes	274(74.25)	1.08(0.52-2.23)	0.831	1.13(0.65-1.98)		0.662
Opportunistic infection						
No	82(22.22)	Ref		Ref		
Yes	287(77.78)	0.24(0.12-1.45)	0.423	2.19(0.91-5.32)		0.082
Viral load test						
No	73(19.78)	Ref		Ref		
Yes	296(80.22)	2.27(1.14-6.53)	<0.001	0.59(0.25-1.41)		0.239
Clinical monitoring						
No	72(19.51)	Ref		Ref		
Yes	297(80.49)	1.43(1.22-2.84)	0.015	0.7(0.3-1.63)		0.402
ART refill						
No	102(27.64)	Ref		Ref		
Yes	267(72.36)	1.25(1.13-2.47)	<0.001	1.9(0.87-4.16)		0.109
Contraceptive use						
No	104(28.18)	Ref		Ref		
Yes	265(71.82)	1.34(0.77-2.33)	0.303	1.50(0.71-3.19)		0.291
Types of the Contraceptives						
Condom	83(31.32)	Ref		Ref		
Implant	87(32.83)	1.23(1.10-2.51)	<0.001	1.26(1.17-2.63)		<0.001
Injection	49(18.49)	0.78(0.37-1.66)	0.518	0.88(0.47-1.96)		0.515
Intrauterine Device (IUD)	7(2.64)	0.29(0.03-2.56)	0.268	0.19(0.13-2.44)		0.265
Lactation amenorrhea	18(6.79)	1.12(0.39-3.21)	0.827	2.18(0.33-4.23)		0.841
Oral	21(7.92)	0.42(0.13-1.35)	0.144	0.72(0.24-2.34)		0.141

Effect of differentiated care on partner involvement during ANC

On partner involvement during antenatal care, this study found that the participants who had their sessions led by a nurse had 2.41 times possibility of involving their partners during ANC in comparison to those who were led by a community health worker as shown in table 4.7 below (COR 2.41, 95% CI 1.16-6.06, $p = 0.025$). In multivariate analysis it was also realized that the participants who had their sessions led by a pharmacist had 3.25 times possibility of involving their partners during ANC in comparison to those who were led by a community health worker (AOR; 3.25, 95% CI (1.14-9.28), $p=0.027$). The clients who had their sessions led by a clinical officer had 3.96 times chances of involving their partners during ANC in comparison to those who were led by community health worker (COR 3.96, 95% CI 1.42-11.01, $p = 0.008$). Furthermore, the findings revealed that those who never had good ART adherence had less chances of involving their partners during

ANC in comparison to those who had good adherence (COR; 0.42, 95% CI 0.18-0.96, $p = 0.04$).

The participants who had gone for a Viral load test had higher intention of involving their partners during ANC in relation to those who had not (COR; 1.34, 95% CI 1.19-2.63, $p < 0.001$). This was also observed in those who had been in clinical monitoring (COR; 1.45, 95% CI (1.24-2.83, $P=0.011$) and those who had their ART refill (COR; 1.36, 95% CI 1.2-1.64, $p < 0.001$). On contraceptive use, the participants who reported using contraceptives had 3.37 times chances of involving their partners during ANC in relation to those who did not use contraceptives (COR; 3.37, 95% CI 1.21-9.66, $p = 0.001$). In multivariate analysis it was realized that the individuals who went for clinical monitoring, had their ART refilled and used contraceptives were more likely to involve their partners during ANC as compared to those who didn't do either shown in the

results as follows: (AOR; 2.47, 95% CI (2.25-6.87), $p=0.027$), (AOR; 1.44, 95% CI (1.24-2.79), $p=0.007$) and (AOR; 1.40, 95% CI (1.19-2.86), $p=0.019$) respectively. These findings are displayed on Table 6.

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Table 6: Effect of differentiated care on partner involvement during antenatal care

Variables	N (%)	COR (95% CI)	P-Value	AOR (95% CI)	P-value
DSD session lead					
Community health worker	124(33.6)	Ref		Ref	
Patient, peers, family	118(31.98)	0.67(0.34-1.31)	0.239	0.72(0.36-1.43)	0.348
Nurse	64(17.34)	2.41(1.16-6.06)	0.025	0.44(0.17-1.14)	0.09
Pharmacist	18(4.88)	3.96(1.42-11.01)	0.008	3.25(1.14-9.28)	0.027
Medical officer	23(6.23)	0.38(0.08-1.72)	0.207	0.39(0.09-1.8)	0.229
Clinical officer	22(5.96)	0.19(0.02-1.47)	0.111	0.22(0.03-1.73)	0.151
ART Adherence					
Good	288(78.05)	Ref		Ref	
Not Good	81(21.95)	0.42(0.18-0.96)	0.04	0.44(0.14-1.35)	0.152
Refill frequency					
Every 3 months	227(61.52)	Ref		Ref	
Every 6 months	142(38.48)	0.84(0.47-1.49)	0.545	0.85(0.47-1.51)	0.571
DC model					
Community Based	142(38.48)	Ref		Ref	
Facility Based	133(36.04)	0.6(0.31-1.15)	0.123	0.64(0.33-1.25)	0.195
Fast Track	94(25.47)	0.77(0.39-1.54)	0.464	0.79(0.4-1.59)	0.518
Psychosocial support					
No	95(25.75)	Ref		Ref	
Yes	274(74.25)	0.85(0.46-1.58)	0.617	0.87(0.47-1.61)	0.652
Opportunistic infection					
No	82(22.22)	Ref		Ref	
Yes	287(77.78)	1.35(0.19-2.63)	0.231	0.52(0.22-1.23)	0.136
Viral Load Test					
No	73(19.78)	Ref		Ref	
Yes	296(80.22)	1.34(1.19-2.63)	<0.001	0.55(0.23-1.32)	0.179
Clinical monitoring					
No	72(19.51)	Ref		Ref	
Yes	297(80.49)	1.45(1.24-2.83)	0.011	2.47(2.25-6.87)	0.027
ART refill					
No	102(27.64)	Ref		Ref	
Yes	267(72.36)	1.36(1.20-2.64)	<0.001	1.44(1.24-2.79)	0.007
Contraceptive use					
No	104(28.18)	Ref		Ref	
Yes	265(71.82)	3.37(1.21-9.66)	0.001	1.40(1.19-2.86)	0.019
Types of the Contraceptives					
Condom	83(31.32)	Ref		Ref	
Implant	87(32.83)	0.52(0.19-1.39)	0.19	0.52(0.19-1.39)	0.19
Injection	49(18.49)	0.53(0.16-1.73)	0.291	0.53(0.16-1.77)	0.305
Intrauterine Device (IUD)	7(2.64)	4.44(0.88-22.36)	0.071	7.9(0.26-49.39)	0.327
Lactation amenorrhoea	18(6.79)	1.18(0.3-4.71)	0.811	1.26(0.31-5.07)	0.747
Oral	21(7.92)	0.99(0.25-3.87)	0.984	1.13(0.28-4.51)	0.865

4.1 Effect of differentiated care on FANC

Table 7 shows that the participants who had their sessions led by a nurse had 1.37 times possibility of having good FANC uptake in relation to those who had their sessions led by community health worker (COR; 1.37, 95% CI 1.64-2.92, $p = 0.011$). In addition, the participants who went for ART refill after 6 months had 0.49 times less chances of having good FANC uptake in relation to those who went for ART refill after every 3 months (COR; 0.49, 95% CI 0.29-0.8, $p = 0.012$) this was also realized in multivariate logistic regression whereby the participants who went for ART refill after 6 months had 0.48 times less chances of having good FANC uptake in relation to those who went for ART refill after every 3 months

Table 7: Effect of differentiated care on FANC

(AOR; 0.48, 95% CI 0.27-0.83, $p = 0.009$). Further, the study revealed that the participants who were on fast track had more possibility to having good FANC uptake in relation to those who were at community based both in bivariate and multivariate as follows (COR;2.9, 95% CI 1.6-5.24, $p < 0.001$) and (AOR;2.92, 95% CI 1.61-5.30, $p < 0.001$) respectively. Finally, on the method of contraception, the participants who mentioned they were using an intrauterine device (IUD) had 7.67 possibilities of having good FANC uptake in relation to those who used condom (COR; 7.67, 95% 2.45-19.75, $p = 0.006$).

Variables	N (%)	COR (95% CI)	P-Value	AOR (95% CI)	P-value
DSD session lead					
Community health worker	124(33.6)	Ref		Ref	
Patient, peers, family	118(31.98)	0.83(0.41-1.66)	0.589	0.8(0.4-1.61)	0.534
Nurse	64(17.34)	1.37(1.64-2.92)	0.011	1.34(0.63-2.85)	0.454
Pharmacist	18(4.88)	1		1	
Medical officer	23(6.23)	1.73(0.61-4.91)	0.302	1.7(0.6-4.83)	0.319
Clinical officer	22(5.96)	1.09(0.33-3.55)	0.886	1.03(0.31-3.37)	0.964
ART Adherence					
Good	288(78.05)	Ref		Ref	
Not Good	81(21.95)	0.86(0.47-1.59)	0.634	0.48(0.2-1.14)	0.097
Refill frequency					
Every 3 months	227(61.52)	Ref		Ref	
Every 6 months	142(38.48)	0.49(0.29-0.86)	0.012	0.48(0.27-0.83)	0.009
DC model					
Community Based	142(38.48)	Ref		Ref	
Facility Based	133(36.04)	0.65(0.34-1.27)	0.209	0.67(0.34-1.3)	0.233
Fast Track	94(25.47)	2.9(1.6-5.24)	<0.001	2.92(1.61-5.3)	<0.001
Psychosocial support					
No	95(25.75)	Ref		Ref	
Yes	274(74.25)	1.5(0.82-2.76)	0.186	1.62(0.88-2.98)	0.125
Opportunistic infection					
No	82(22.22)	Ref		Ref	
Yes	287(77.78)	0.54(0.31-2.94)	0.153	0.63(0.29-1.4)	0.258
Viral load test					
No	73(19.78)	Ref		Ref	
Yes	296(80.22)	0.56(0.32-1.01)	0.052	0.79(0.35-1.8)	0.574
Clinical monitoring					
No	72(19.51)	Ref		Ref	
Yes	297(80.49)	0.79(0.43-1.45)	0.447	0.82(0.44-1.54)	0.541
ART refill					

No	102(27.64)	Ref		Ref	
Yes	267(72.36)	0.86(0.5-1.49)	0.594	1.4(0.72-2.74)	0.325
Contraceptive use					
No	104(28.18)	Ref		Ref	
Yes	265(71.82)	0.89(0.52-1.54)	0.683	1.05(0.50-2.21)	0.895
Types of the Contraceptives					
Condom	83(31.32)	Ref		Ref	
Implant	87(32.83)	0.58(0.26-1.29)	0.18	0.58(0.26-1.29)	0.18
Injection	49(18.49)	1.05(0.45-2.45)	0.919	1.07(0.45-2.51)	0.881
Intrauterine Device (IUD)	7(2.64)	7.67(2.45-19.75)	0.006	15.99(0.74-34.5)	0.082
Lactation amenorrhea	18(6.79)	1.03(0.3-3.52)	0.96	1.09(0.32-3.76)	0.89
Oral	21(7.92)	1.13(0.36-3.5)	0.834	1.28(0.41-4.06)	0.671

IV. DISCUSSION

This study investigated the effect of a differentiated care model on pregnancy intention, preconception care, partner involvement, and antenatal care uptake among women of childbearing age receiving ART in Kisumu County and involved 369 women. This study, like many others before it, was based on the central role that the model of care has been shown to play in influencing the use and outcome of various aspects of ART. (Ehrenkranz *et al.*, 2019; Geng & Holmes, 2019; Grimsrud *et al.*, 2016).

Nearly half of the participants were aged below 30 years, the predominant age group being 25-30 years, providing an ideal reproductive age women (Reidenbach *et al.*, 2019). The fact that only about one-thirds of the participants had only up to primary education implies that most of the clients had satisfactory education background to be able to understand and adhere to the schedules of the DSD model accordingly, as have variously been reported (Ayalew *et al.*, 2020; Reidenbach *et al.*, 2019; Thindwa *et al.*, 2019).

Only about 63% of the participants were using contraceptives, indicating a huge need for contraception, especially against a backdrop of unplanned childbearing. This is in concordance with a study by Bemelmans *et al.* (2014), reporting a 35% unsatisfactory contraceptive need among women living with HIV on DSD in Malawi. This finding also agreed with earlier reports from Kenya that the increased number of mistimed conceptions are largely attributable to a lack of contraceptives, which was about 25% among married women in the general Kenyan population, with a national modern contraceptive prevalence of about 39% (Cordero *et al.*, 2019). The revelation that condom use is the predominant form of contraception (33.6%) among the respondents here points to either little effort to prevent transmission via sexual intercourse or an inaccurate reporting of condom use as a

contraceptive, which may need further investigation. According to the DSD model, one plausible explanation for the low contraceptive uptake and high number of unplanned pregnancies is that, while DSD reviews are conducted every three months, oral contraceptives should be refilled monthly (with occasional multi-month prescriptions of no more than three months for those who adhere to prescription). Usually, contraception clinics are synchronized with ART pick-up dates, with other health facilities integrating the services. It is possible that the clients defaulted as they had longer appointments for ARV refills as they were either delivered in the community or through the fast-track program. It is highly likely that the design of the program contributed to the unmet need.

While up to 93% of the participants in this study confirmed that the pregnancies were not intentional, about 99% of the same participants had PMTCT services or safe pregnancy. This may be due to either the perceived dangers associated with childbirth or the need to protect the unborn and newly born child from HIV infection. Such explanations were earlier described (Mnyani *et al.*, 2014).

This study further revealed dismal ANC attendance, with only 16% having completed 4 visits as scheduled, in agreement with the findings from Malawi that equally recorded underutilization of the ANC services among women on DSD (McHenga *et al.*, 2019) and lower than Kenya's and Kisumu's figures at 32.6% and 38.8% respectively (KHIS, 2017). Ordinarily, FANC requires at least four ANC visits. (Asah-Opoku *et al.*, 2019; WHO, 2016a). Even though the participants had at least one ANC visit, they commenced at a late gestation, preventing them from receiving comprehensive FANC services as prescribed.

While about 73% of the participants had pregnancy assessment before DSD, less than 1% had it after DSD, indicating a clear negative impact DSD imposes on this critical reproductive health service. This is a clear

indication that those who got pregnant after DSD were not offered preconception care, resonating with the Ethiopian scenario (Kassa *et al.*, 2018). On the other hand, partner involvement during pregnancy was only at about 14%, which is consistent with global findings, especially from Ethiopia (Ayalew *et al.*, 2020).

Differentiated care and pregnancy intention

The function of the various service or information providers is crucial to the subsequent acceptance. According to this study's findings on the effect of differentiated care on pregnancy intention in women of childbearing age receiving ART, those whose sessions were led by patients, their peers, or family members were 0.31 times less likely to intend pregnancy than those whose sessions were led by the community health worker. This is probably because of the community's faith in the CHVs, which is a result of their expertise and education in issues pertaining to HIV care at the community level (Bemelmans *et al.*, 2014; Cordero *et al.*, 2019).

The study also revealed that, in contrast to those who had high adherence, women who never followed the requirements of the differentiated care had a relatively lower likelihood of planning to carry a pregnancy (Salters *et al.*, 2017; Thindwa *et al.*, 2019). Moreover, the study demonstrates that the women of reproductive age but on ARVs who went for ART refill after six months were 0.45 times less likely to have pregnancy intentions compared to those who went for ART refill after every three months, consistent with the findings of (Prust *et al.* 2017) in Malawi. Similar to a previous study in Ghana (Adjetey *et al.*, 2019), this study revealed that the participants who obtained facility-based care were 1.32 times more likely to intend pregnancy as compared to those who were community-based. There was however a slight departure from the results of another Malawian study, where user fee in non-governmental health facilities was identified as a significant barrier to general access to maternal health services (Mamba *et al.*, 2017). This observation, while not exactly replicated in each setting, may still be reflected in different ways, including other healthcare-associated costs. Women who used contraceptives were less likely to intend pregnancy as compared to those who never used contraceptives, which contradicts earlier findings by Mersha *et al.* (2019), which showed that Ethiopian women who used contraceptives avoided unintended pregnancies. This difference in observations remains difficult to decipher, although it is highly probable that those using contraceptives are doing so to protect against pregnancy too, thereby watering down the notion of a future pregnancy. The converse had also been earlier reported in Kenya, where lower number of previous pregnancies and pregnancy intention is associated with an

increased prevalence of inadequate supply of contraceptives (Long *et al.*, 2019).

In the current study, the those who used intrauterine devices (IUDs) and oral contraceptives were less likely to intend pregnancy as compared to condom use, a finding which resonated with a previous finding from Atlanta, USA, where misconceptions drove the choice of contraception used, and where counseling was found crucial (Tote *et al.*, 2018), and another in USA that reported that reported low (6%) use of long-acting reversible contraceptives (LARC), and a high prevalence of unintended pregnancy (Sutton *et al.*, 2018).

Differentiated care and preconception care uptake

Preconception care remains pivotal in ensuring favorable pregnancy and birth outcomes (Jourabchi *et al.*, 2019; Kizirian *et al.*, 2019). An analysis of the impact of differentiated care on preconception care uptake indicated that participants whose sessions were led by nurses were 2.06 times more likely to attend preconception care compared to those who were led by community health workers (CHWs), also called community health volunteers (CHVs). Related findings were earlier revealed in a preconception care needs assessment by (Reidenbach *et al.* 2019), who found the specific cadre of health care provider as crucial in determining its uptake. On the other hand, women reproductive age taking ARVs were 6.5 times more likely to attend pre-conception care sessions led by clinical officers than those led by CHWs. This observation carries a lot of sense, given the nurses and clinical officers are professionals better trained than CHWs in matters relating to reproductive health, and thus expected to better promote preconception care matters (Kizirian *et al.*, 2019). In terms of the differentiated care model, the facility-based respondents were 1.44 times more likely to attend preconception care unlike those in the community-based model. This may be accounted for by the fact that preconception care services are typically provided in healthcare facilities, a practice to which the study participants and the community are used (ACOG, 2005; Kizirian *et al.*, 2019). Further examination on the data revealed that the respondents who had been to the laboratory for a viral load test had higher intention to attend preconception care than those who had not, as was also seen this was also discovered in those who had undergone clinical monitoring and had their ART refill. This could also be a reflection of a positive health-seeking behaviour, in which those who had the practice of attending the regular services also found it easy to attend the less practiced, like preconception care in this case.

Looking at the type of contraceptive used, those who were using implants were more likely to attend preconception care as compared to those using the condom. This is likely

due to the fact that implants from time to time may create need for consultations, either due to side effects, or at the points of insertion or removal. On the other hand, condoms are easily usable by the individuals, thereby needing no professional support (Hibbert *et al.*, 2018; Shand *et al.*, 2019).

Differentiated care and partner involvement during antenatal care

During this study, the interaction between differentiated care and partner involvement during antenatal care for women of reproductive age was examined, and the findings showed that the respondents who had their sessions led by a nurse or a clinical officer were 2.41 and 3.96 times, respectively, more likely to involve their partners during ANC compared to those who were led by CHWs. Consistent with some previous studies, the explanation offered by the professionally trained health care providers is more scientifically enriched, thereby making a better understanding of the needs for partner involvement compared to CHWs (Melis & Fikadu, 2022; Yeganeh *et al.*, 2019). This does not however underestimate the critical role played by the CHWs but is a pointer to redefining the nature and quality of services they can offer, looking particularly at the content. This study further revealed that those who did not have good adherence to ART were less likely to involve their partners during ANC, reflective of a general correlation of poor health-seeking behaviour and uptake of the various interventions availed towards a variety of health issues. The finding here is consistent with that of (Wesevich *et al.*, 2017), who found that male partner ART reminders were associated with retention on care among participants in Malawi's Option B+ program (aRR 1.16, 95% CI 0.96-1.39), where a 68% adherence was reported. Also, the respondents who had undergone viral load testing, just like those who had been in clinical monitoring and had their ART refill, were all more inclined to involving their partners during ANC as opposed to those who had not taken the respective action. Finally, the respondents who used contraceptives were 3.37 times more likely to involve with their partners during ANC in relation as compared to those who did not use contraceptives. This could in part stem from the fact that during health education mainly offered at health facilities, and strengthened by CHVs, the importance of partner involvement is discussed, raising awareness (Hampanda *et al.*, 2020; Mamo *et al.*, 2021; Melis & Fikadu, 2022).

5.1.1 Differentiated care and FANC

The study looked into the impact of differentiated care on FANC among women of reproductive age receiving facility based and community-based ART refill, since the impact of ART on ANC attendance, alongside other factors, has been documented (Asah-Opoku *et al.*, 2019;

Chorongu *et al.*, 2016; Woyessa & Ahmed, 2019). In this study, the respondents who had their sessions led by a nurse were 1.37 times more likely to have good FANC uptake as compared to those who had their sessions led by CHVs, an observation attributable to the fact that FANC takes place at the health facility, where trained health professionals like nurses are better equipped to inform and influence the behaviour of mothers seeking antenatal care services (Gebretsadik *et al.*, 2019; Prust *et al.*, 2018). On the other hand, those who went for ART refill after six months were 0.49 times less likely to have good FANC uptake as compared to those who went for ART refill after every three months. Such findings have been demonstrated previously in Zambia, where *stable* patients on ART were found to have the tendency to attend clinic less frequently (Eshun-Wilson *et al.*, 2019). The respondents on fast track program were 2.9 times more likely to have good FANC uptake as compared to those community-based delivery interventions, conforming with reports from Malawi by (Prust *et al.*, 2018). Lastly, the respondents who mentioned using IUDs were 21.67 times more likely to have good FANC uptake as compared to those who used condom, as previously reported elsewhere (Hibbert *et al.*, 2018; Thindwa *et al.*, 2019; Tote *et al.*, 2018).

V. CONCLUSION

This study reports that the use of differentiated care had influence on pregnancy intention among women of child bearing potential on ART, comparing the group who went for refill after six and that who went after 3 months, although women on facility-based care had higher chances of pregnancy intention. In addition, both contraceptive use and ART adherence were significant, although not significantly associated with pregnancy intention. Differentiated care had a low influence on preconception care uptake by women of child bearing potential on ART. However, women who sought facility-based care, especially provided by nurses and clinical officers, had higher chances of getting preconception care, especially due to the availability of psychological support in the facility-based DSD model. This model had fairly good positive association with partner involvement during antenatal care for women of reproductive age on ART, especially for facility-based interventions sought the help of nurses and clinical officers had higher chances of involving their partners in antenatal care. This study further found that the use of the DC model had a positive impact on FANC for women on ART, particularly for those who were in the facility-based model, who had higher chances of ARV drug refills.

VII. RECOMMENDATIONS

1. The Ministry of Health through NASCOP should review the DSD guidelines to enhance SRH services

uptake, especially ensuring that contraceptive refills are not missed due to the long return dates when these clients come for ARV refills.

2. The Ministry of Health, through NASCOP and all organizations involved in provision of care for HIV-infected women should include mechanisms that ensure sufficient preconception care for both stable and unstable clients, and for facility-based and community-based clients.
3. The Ministry of Health should enhance approaches that promote partner involvement among women of reproductive age using ARV drugs.
4. The Ministry of Health should put in measures that promote FANC uptake, through research, advocacy, and community outreach initiatives to improve and sensitize members of the communities on women's reproductive health and care, especially those who are put in the community-based DC model.

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