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Adherence to Antiretroviral Therapy by Pregnant Women Accessing Antenatal Clinic at The University of Port Harcourt Teaching Hospital, Tertiary Institution in Rivers State

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ABSTRACT

Background: Non-adherence to antiretroviral therapy (ART) by pregnant women living with HIV/AIDS is a problem that has been reported to have adverse effects on the mother and the unborn child and this is a major public health issue in high- and low-income nations. Virological and clinical success depends critically on elevated adherence to ART, without which maternal disease can develop, with its attendant increase in the risk of vertical mother-to-child transmission. The level of non-adherence to ART is high in many communities in Nigeria. This study assesses the level of ART adherence and identifies factors that influence nonadherence among pregnant women living with HIV/AIDS.

Materials and methods: This was a descriptive cross-sectional study of 236 HIV pregnant women on ART assessing the PMTCT services of the Antenatal Clinic at the O&G Department of the University of Port Harcourt Teaching Hospital. The study was carried out for a period of three months. The respondents were selected using a multistage sampling method and were interrogated using semi structured questionnaires. Statistical package for Social Sciences (SPSS) V22 and Chi-square test with a p value of < 0.05 as statistically significant were used for data analyses.

Results: Out of the 236 respondents that were used for the study, 16.1% reported ART adherence problems while 83.9% reported 100% adherence, which is considered good. Constant exhaustion and frequent sleeping were the basic explanations given for missing out doses by the non-adherents. Socio-demographic variables found to be significantly associated with adherence were marital status 59.1% and age 63%, with married women and younger women more likely to adhere to ART instructions.

Conclusion: This study shows that pregnant women can achieve good adherence to ART medication if encouraged. There is the need for more comprehensive awareness programmes on ART adherence and on other possible constraints to adherence to achieve the adherence rate of 100% recommended by the Federal Ministry of Health, Nigeria.

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Introduction

The use of ARV medications has evolved over the years, from basically treating people with HIV to preventing the spread of the infection [1]. ARV drugs have also been significant in preventing vertical transmission which is mostly responsible for infections in children aged 15 years and below [1]. Recent developments in antiretroviral therapy have dramatically reduced the frequency of HIV infection-related hospitalization, opportunistic infections, the risk of mother-to-child transmission and deaths [1]. However, despite the availability of ART medications in the prevention

of mother-to child transmission, Nigeria still has the highest number of HIV-infected babies worldwide [1]. A review of major studies in different countries of the world identified that adherence to ART remains the major challenge [2]. According to a study by Omonaiye et al in 2019, adherence to ART among pregnant women in Nigeria is low, at a level of 32.7% [3]. In a study conducted in the south-Western part of Nigeria, 47% of pregnant mothers who were HIV positive adhered to their ART drugs. In the south-East region of the country, a study by Agboeze, Onwe, Onoh, Nwali, Ukaegbe and Ikeola reported an adherence rate of 89.2% in the same group of people [4]. However, among people infected with HIV in the south-South, particularly Port Harcourt city of Rivers State, a report by Kaote

in 2019 showed an 86.0% level of medication adherence. No recent study was published for south-South especially Rivers State to reveal the adherence level among pregnant women who are infected. Therefore, continuous monitoring and assessment processes for adherence need to be enforced.

The lack of progress in Nigeria to address the high prevalence of perinatal transmission, made the government in 2015, take a bold move to concentrate on improving MTCT interventions in the states that recorded high infection rate. Rivers State is one of the identified states with high prevalence rate of 15.2% among women who attend antenatal (ANC) clinics [5]. University of Port Harcourt Teaching Hospital (UPTH) in Rivers State is one of the recognized treatment centers that provide PMTCT services for inhabitants of Rivers State and other neighbouring States. The PMTCT Programme commenced in 2002 and it has been managed by the Antenatal clinic (ANC) at the UPTH.

Elimination of mother-to-child transmission of HIV in Nigeria by 2021 is one of the targets of the National HIV and AIDS Strategic Framework (NSF) 2017-2021 and National HIV and AIDS Strategic Plan (NSP) 2017-2021. UNICEF has equally incorporated HIV programs to form part of the contributions of the Sustainable Development Goals. The goals are 'Fast tracking the HIV response for pregnant women, mothers, children and adolescents by 2020 and building a resilient government and community systems to decrease HIV service inequities among pregnant women, mothers, children and adolescents and reduce gender, age and socio-economic HIV-related vulnerabilities'. These activities alone are certainly not the only options if discrepancies in adherence are not addressed [6]. There have been variables in adherence with better results obtained in developed countries than in the developing countries like Nigeria [2,5]. In the view of high MTCT burden in Nigeria, there have been limited studies on ART adherence during pregnancy and at the postpartum period. This makes it vital to understand the factors that affect adherence among these groups. Hence this study seeks to assess the level of adherence and identify factors that influence adherence among HIV infected pregnant women in Port Harcourt, Rivers State, Nigeria.

Methodology

Study Area

This study was carried out at the antenatal clinic (ANC) of the Obstetrics and Gynaecology Department in the University of Port Harcourt Teaching Hospital, Port Harcourt, Rivers State. This PMTCT Programme at the ANC started in 2002, it works to ensure the wellbeing of the mother and fetus.

Study Design

A descriptive cross-sectional study was carried out among pregnant women who received PMTCT services at the time of the study (April- July, 2020) at UPTH.

Inclusion Criteria

Pregnant women who received PMTCT services from UPTH and have been on ART for at least 3 months before the time of study.

Exclusion Criteria

Severely ill pregnant mothers.

Sample Size Determination

Sample size of the study (n) was determined with the formula: $n = Z^2pq/d^2$.

Where n = required sample size

Z= standard normal deviate at 1.96

P = prevalence of adherence to ART amongst pregnant women in Nigeria, 89.2% [4].

q= 1-p,

p = 0.892, 1 - 0.892 = 0.108

d = confidence level of 95% with a tolerance margin set at 5%.

$n = 1.96^2 \times 0.89^2 \times 0.108 / (0.05)^2$

n= 148

10 % Non-response = $0.1 \times 148 = 25$; $148 + 25 = 173$.

Sampling Method

A multi-stage sampling was employed after ascertaining the total of HIV-pregnant women who visited the PMTCT clinic for the period of three months.

Stage 1: using a stratified sampling method, participants were allocated into strata of Monday-Friday mothers. UPTH runs five (5) days of antenatal services, so the total number of pregnant mothers who received PMTCT services in these different days were ascertained through the previous record of attendance list. From January to March of 2020, a total of 1,422 women came to the PMTCT clinic.

Stage 2: using proportionate to size formula, more participants for data collection were allocated to Tuesdays and Wednesdays as previous records from the clinic register shows that these days had greater turnout than other days.

Proportionate to size formula $Nf = \frac{xn}{\sum x}$,

N= Total number of eligible participants

x = average number of women for each day of the week

n= calculated sample size

$\sum x$ = aggregate number of women that come in a month.

Stage 3: A systematic random sampling was employed to select eligible participants for the study. This involved obtaining a sample interval K using the formula:

$K = N$ (study population)/n (sample size).

From previous attendance list, the average study population revealed; 1422, hence sample interval $K = 1422/275 = 5.3 \approx 5$. The first participant was chosen randomly, the sample size was completed by selecting every other fifth eligible participant.

Study Instrument

A pretested semi-structured interviewer administered questionnaire that addressed the research objectives was adapted from validated questionnaires adapted from National Demographics Health Survey and similar research in other settings. The questionnaire apprehended their socio demographic characteristics, pregnancy details, HIV and treatment related characteristics. It equally captured questions on their self-reported adherence levels and factors affecting adherence.

Training of research assistants

Two research assistants were recruited to assist in data collection the study. These assistants are familiar with what the work entails as they were given orientation on what the work hopes to achieve.

Validity/Reliability of Instrument

Validated questionnaire were used for the study. This validation was based on the HIV and medication adherence adapted from National Demographic and Health Survey (2018) and on questionnaires from similar studies in reputable journals.

A pre-test was done at the Rivers State University Teaching Hospital, (RSUTH) Port Harcourt. Questionnaires were administered to 16 respondents at RSUTH. This represents the 10% of the study sample size which was: $10\% \text{ of } 163 = 16.3 \sim 16$. After one week, same questionnaires were served to these 16 respondents to evaluate the consistency of their responses.

Study Procedure/Data collection Process

On the days for data collection, those present at the time of the study for their routine PMTCT services at UPTH were welcomed. The principal investigator and the trained research assistants addressed the significance of the study. Written informed consent was obtained from those willingly to participate in the study before the interview. Each participant was assigned an identifiers to avoid repetition of the interview.

Data analysis

The study assessed adherence to ART, and dose adherence was the primary outcome.

Assessment of adherence

Adherence status of the participant was the main outcome variable. A participant was said to be adherent if she had not missed taking any doses over the four -day period before the survey day. Non- adherence is if she had missed at least one dose over the four days prior to the study. The 4-day recall was employed because it has a short timespan so the participant will easily remember the history of her medication intake. This also agrees with the Adult AIDS Clinical Trials Group (AACTG) 4-day recall being used [3]. Self-report was used to assess adherence level and the following formula was equally used. Adherence (%) = Number of pills (doses) taken /Number of pill prescribed or supposed to be taken $\times 100$ [4].

Adherence level was classified into 'good adherence' for persons with 100% level of adherence and poor adherence for those with <100% [7]. For those reported to have missed their dose, reasons for missing were elicited [8].

Additionally, four self-report inquiries were used for adherence assessment, and a score of 25% was attached to each question. Those who answered all the questions correctly were said to have good adherence while those who responded incorrectly to less than the four were said to have poor adherence. The questions were: have you missed taking a dose of your ART in the last four days? and how often it was missed?, reasons for missing, have you been able to take all the ART according to directives?, and does the medication have a positive effect on your health?.

Statistical analysis

Statistical Package for Social Sciences (SPSS) software version 22 was used for analysis after data entering and coding was done. Frequency distribution and measures of central tendency was employed to describe the study respondents in relation to variables under study while for the inferential statistics, bivariate associations between patient characteristics, medication-taking behaviours and the outcome variable (ART adherence) were examined using Chi-square tests. A p-value < 0.05 was significant.

Ethical considerations

The Ethics and Research Review Board of the University of Port Harcourt, Port Harcourt, gave approval for the study. Approval was also obtained from the Ethical Committee of University of Port Harcourt Teaching Hospital. Written Consent was obtained from each participant and they had liberty to withdraw from the study at any time.

Study Limitations

Some participants had issues trying to recall number of missed doses, this might have led to over- or under- reported adherence level.

Results

Response Rate/ Completeness of Data

240 questionnaires were served; 236 questionnaires were completely filled and utilized for the analysis which gave a response rate of 98.3%.

Section 4.1: Socio-Demographic Features of Respondents Table 4.1a: Distribution of age, marital status, education, and occupation of the respondents

Variables	Frequency (n=236)	Percent
Age (years)		
20-24	30	12.7
25-29	113	47.9
30-34	69	29.2
35-39	24	10.2
Marital Status		
Single but living with partner	14	5.9
Single and not living with partner	77	32.6
Married and living with partner	117	49.6
Married and not living with partner	28	11.9
Level of Education		
No formal education	0	0.0
Formal education		
Primary education	5	2.1
Secondary education	144	61.0
Tertiary education	87	36.9
Employment status		
Unemployed	45	19.1
Employed		
Civil servant	18	7.6
Self-employed	133	56.4
Private institution employed	40	16.9

Mean Age = (30.5 ± 49.8)

Table 4.1a shows that 113 (47.9%) were in the age range of 25-29years with the mean age of (30.5 ± 49.8) . Most of the respondents 117 (49.6%) were married and living with partner, (61.0%) had a secondary school certificate, and most 133 (56.4%) were self-employed.

Table 4.1b: Distribution of income, ethnic group, religion of the respondents

Variables	Frequency (n=236)	Percent
Income (n=191)		
≤N30000	116	60.4
≥ N30000	76	39.6
Ethnic Group		
Hausa	9	3.8
Yoruba	14	5.9
Ikwerre	60	25.4
Other tribes	72	30.5
Igbo	81	34.3
Religion		
Christian	229	97.0
Muslim	7	3.0

Table 4.1b shows that 116 (60.4%) of the respondents had a monthly earning of ₦≤30000, 132 (55.9%) were from tribes other than Igbo, Hausa and Yoruba. However, most 229 (97.0%) of them were Christians.

Section 4.2: Obstetric and HIV related Treatment, Care and Support Characteristics

Table 4.2a: Obstetric and HIV related treatment

Variables	Frequency	Percent
Gestational Age (weeks)		
<13 weeks	94	39.8
13-28 weeks	89	37.7
>28 weeks	53	22.5
Parity		
None	87	36.9
One	54	22.9
Two	44	18.6
Three	26	11.0
Four or greater than four	25	10.6
Time of HIV diagnosis		
Before getting pregnant	204	86.4
During this pregnancy	32	13.6
Duration of diagnosed HIV		
≤6months	25	10.6
7-12months	11	4.7
13-18months	14	5.9
≥19months	186	78.8
Commencement of HIV drugs		
During this pregnancy	35	14.8
Before this pregnancy	201	85.2
Duration on medications for HIV		
≤6months	29	12.3
7-12months	16	6.8

13-18months	13	5.5
>18months	178	75.4
Type of antiretroviral therapy		
First Line	189	80.1
Second Line	47	19.9

Table 4.2a shows that 94 (39.8%) of the respondents were in the gestational age of 13weeks and below, 87 (36.9%) have not given birth before. Most 204 (86.4%) of them were diagnosed before the got pregnant, while 186 (78.8%) were diagnosed over 19 months. Also, 201 (85.2%) were first prescribed HIV medications during this pregnancy, 178 (75.4%) have been on it for 19months or more and 189 (80.1%) are on first line antiretroviral therapy.

Section 4.4: ART medication Adherence

Table 4.3a: ART medication Adherence

Variables	Frequency (n=236)	Percent
Condition of health since after ART commencement		
Worse	0	0.0
Stable	115	48.7
Better	102	43.2
Don't know	19	8.1
Missed taking a dose of your antiretroviral therapy in the last four days		
Never	198	83.9
Once	17	7.2
Twice	6	2.5
Greater than twice	15	6.4
Barriers to adherence (n=38)		
Tiredness & sleeping off	8	21.1
Out of stock drugs		
Religious activity	6	
5	15.8	
13.2		
Busy work Schedule	4	10.5
Food requirement of the drug	4	10.5
Forgetfulness	4	10.5
Afraid of someone identifying my HIV drugs	2	5.3
Others	5	13.2

Table 4.3a shows that 48.7% reported a stable health status since commencement of drugs, (83.9%) reported never to have missed a dose and (21.1%) who missed were majorly due to tiredness and sleeping off.

Table 4.3b: Respondent's level of ART medication Adherence

Adherence Behaviour	Frequency (n= 236)	Percent
Good Adherence	198	83.9
Poor Adherence	38	16.1

Table 4.3b Showed that 83.9% had good ART medication adherence, while 16.1% had poor ART medication adherence.

Section 4.5: ART adherence facilitating factors

Table 4.4: ART Adherence facilitating factors

Variables	Frequency	Percent
Reasons for adherence to ART (n=198)		
To stay healthy and alive	74	37.4
I was told to do so by my counsellors	59	29.8
To protect my unborn child	36	18.2
Informed by my previous PMTCT experience	11	
Others	11	5.6
Want viral load to be suppressed	7	3.5
Current Viral load (cp/ml) (n= 236)		
1-1000	226	95.8
≥1001	10	4.2

Table 4.4 shows that 37.4% reported that they adhered to ART drugs to stay healthy and alive, and 95.8% had a viral load (cp/ml) of 1-1000.

Table 4.5a: Association between ART medication adherence and obstetric history and HIV related treatment

Variables	ART medication adherence		Test of association	
Obstetric history and HIV related treatment	Good n (%)	Poor n (%)	X ²	p-value
Gestational age (weeks)				
<13	84 (40.4)	10 (35.7)	1.723	0.422
13-28	80 (38.5)	9 (32.1)		
>28	44(21.2)	9(32.1)		
Parity				
≤2	161 (77.4)	24 (85.7)	1.006	0.316
>2	47 (22.6)	4 (14.3)		
Diagnosed of HIV				
Before getting pregnant	179 (86.1)	25 (89.3)	0.631	0.427
During this pregnancy	29 (13.9)	3 (10.7)		
Duration diagnosed of HIV (months)				
≤12	33 (15.9)	3 (10.7)	0.507	0.477
>12	175 (84.1)	25 (89.3)		
First prescribed HIV medications during this pregnancy				
Yes	32 (15.4)	3 (10.7)	0.426	0.514
No	176 (84.6)	25 (89.3)		
Duration on medications for HIV (months)				
≤12	41 (19.7)	4 (14.3)	0.471	0.493
>12	167 (80.3)	24 (85.7)		
Type of antiretroviral therapy				
Second Line	44 (21.2)	3 (10.7)	1.686	0.221

First Line	164 (78.8)	25 (89.3)		
Disclosed your HIV status to Spouse/Partner				
Yes	125 (60.1)	18 (64.3)	0.181	0.670
No	83 (39.9)	10 (35.7)		

Statistically significant ($p \leq 0.05$)

Table 4.5 shows that no significant association existed between gestational age, status disclosure to Spouse/Partner and medication adherence. Also, there was no association between medication adherence and the following; number of children given birth, HIV diagnosis, duration of diagnosis, when medications was first prescribed, duration on medications, and type of ART.

Table 4.6: Association between ART medication adherence and Socio-demographic characteristics

Variables	ART medication adherence		Test of association	
Socio-demographic characteristics	Good n (%)	Poor n (%)	X ²	p-value
Age (years)				
20-29	131 (63.0)	12 (42.9)	4.185	0.041*
30-39	77 (37.0)	16 (57.1)		
Marital Status				
Single	85 (40.9)	6 (21.4)	3.935	0.047*
Married	123 (59.1)	22 (78.6)		
Level of Education				
≤Primary	5 (2.4)	0 (0.0)	0.688	0.407
≥Secondary	203 (97.6)	28 (100.0)		
Occupation				
Unemployed	14 (7.7)	2 (8.0)	0.003	0.957
Employed	168 (92.3)	23 (92.0)		
Income (in Naira)				
<30,000	101 (59.8)	15 (65.2)	0.252	0.616
>30,000	68 (40.2)	8 (34.8)		
Ethnic group				
Igbo	67 (76.1)	14 (87.5)	1.015	0.314
Other	21 (23.9)	2 (12.5)		
Religion				
Christianity	201 (96.6)	28 (100)	0.971	0.324
Islamic	7 (3.4)	0 (0.0)		

Statistically significant ($p \leq 0.05$)

Table 4.6 shows that a significant association existed between age ($p=0.041$), marital status ($p=0.047$) and medication adherence. This implies that being married and being below 29years of age were associated with good HAART adherence. However, there was no statistical association between educational status, occupation, ethnic group and medication adherence.

Discussions

Demographic and Socio-economic characteristics

The 2012 National HIV-AIDS Reproductive and Health found HIV to be prevalent among the 25– 39year age group. This is somewhat in congruence with the findings of this study as age group of 25-29years were more predominant in the study. This identifies the need to reinforce HIV/AIDS prevention campaign and reproductive health care programs to abate the menace done by this infection.

In this study, 61.0% of the respondents were secondary school degree holders and had good adherence than those in the lower cadre. This does not agree with the work of Riley et al. in the San Francisco Bay who found out that those with lower educational background adhered more than the college graduates. Similarly, Oliveira Filho et al. identified high educational background to be linked inversely with adherence. The study settings and time of study might account for the variations seen in these studies. However, a most recent cross- sectional approach by Omonaiyea, Kusljicb, Nicholsona, Mohebbia, & Manias in four health care sites in Akwa Ibom State, Nigeria was in agreement with the findings of this study as it identified increased education level to

be linked with adherence [3]. (OR = 1.7, $p = 0.006$). The use of same study design may be responsible for the similarities in the findings.

More than half (56.4%) of the women surveyed were self-employed. However, there was no association between adherence and occupation. Although, Zacharius et al.'s work identified those in informal sector having an 8% chance of adherence than those in formal sector. While the unemployed had lower adherence. This could be because the employed had more money than the unemployed and could afford the cost of transportation to health facilities. In addition, the thought of not having any means of livelihood can bring about depression, hence, a dampened spirit towards drug consumption.

In this survey, majority were Christians (96.6%) probably because Christianity is the prime religion of the inhabitants of Rivers State. Rivers State is the home of many ethnic group, this is reason for the great number of the Igbo tribe seen in the study. Also, some of the nearby states are also Igbo speaking. However, there was no statistically relationship between adherence and religion and ethnic group. ($P > 0.05$). Nevertheless, involvement of spiritual leaders in adherence counseling may help to improve adherence as they ought to be role models to their congregations.

Level of adherence to ART among HIV pregnant women

Among the 236 study participants, 83.9% had 100% adherence rates while the rest had missed a minimum of one dose during the 4-day period prior to study. This is in line with the work of Ekama, Herbertson, Addeh, & Gab-Okafor, et al done in Nigeria where 80.6% of adherence rate was reported [9]. Also, Agboeze et al., in Ebonyi and Onyeonoro et al., in Nnewi reported similar rate of 89.2% and 86% correspondingly [4]. Similarities of these findings might be as a result of the socio-demographic features and use of same study design. However, adherence rate in South-West Nigeria as reported by Oginni, Aremu, Olowokere, Ayamolowo and Komolafe is significantly lower 47% when compared to this study. This low adherence level could be because they relied on secondary data. However, this does not meet with average level of >95% recommended by PEPFAR and the 100% adherence level suggested by the Nigeria Federal Ministry of health. It serves as a reminder that adherence to ART remains an issue of concern in Nigeria. Studies have shown amidst the fears of poor adherence to medication earlier seen that the adherence levels in developing nations is parallel to or above that in developed countries. For instance, a cross-sectional study design conducted in public health sectors of Lusaka, Zambia by Mukosha, Chiyesu, & Vwalika showed the median adherence levels to be at 96%. Similarly, study conducted by Shibabaw, Melkam, and Shiabbaw at Ayder Referral Hospital, Northern Ethiopia Wondale revealed a good ART adherence with thirty nine women having good adherence rate ($\geq 95\%$) out of a total of 41 that were interviewed [10]. A review by Vreeman et al., revealed that the studies in developing nations reported adherence levels higher than 75% (range 45–100%), while developed countries had lower than 75% (range 20–100%). Also, in the San Francisco Bay area, Riley et al. found an adherence rate of 44%. A systematic review by Mills et al obtained 77% adequate adherence by sub-Saharan Africa patients, while North American patients had 55%. This study proposed that adherence is a concern in North America.

Adherence among expectant mothers can be said to be better than in other groups. Studies conducted in the same setting of South-south Nigeria by Nwauche et al in 2006 and Asekomeh et

al 2010 among HIV infected individuals reported adherence rate of 49.2% and 72.2%. This is however lower when compared with the findings of this study. Well, this is not unanticipated as women are children-lovers, they are deeply committed to their wellbeing.

Barriers to adherence in pregnancy among HIV pregnant women

Adherence to ART has been poorly reported as a result of different obstacles [9]. Nausea and vomiting, and possible effect of the drugs on the fetus are further causes of adherence issues in pregnancy [9]. However, this study identified similar reasons reported for non-adherence among the non-gravid women. These include; tiredness & sleeping off which was the major reason identified for non-adherence, other identified reasons were; Out of stock drugs, Religious activity, Forgetfulness, Busy work Schedule.

This implies that the reasons for missing drugs are not as a result of pregnancy related factors, but other peculiar reasons. Similar studies in Nigeria and Ethiopia documented that feeling sick, being busy and out of stock drugs were common reasons. Contrary to the findings of Igwegbe, where 63.6% of women expressed fear of stigmatization as the reason for missing their drugs, deducing that this remained an important factor mitigating against quality HIV care. Social stigmatization and discrimination was not significant in this study. However, this does not imply that persistent efforts should not be made towards discouraging stigmatization of people living with HIV.

Factors that facilitate adherence among HIV pregnant women

Constant adherence is linked to better outcome. The following were identified as contributing factors of adherence;

Socio-Demographic characteristics

There are conflicting evidence on the relationship between socio-demographic factors and adherence behavior [11]. While some factors like younger age, ethnicity, lower income, lower literacy and unstable housing were reasons for non-adherence in developed countries; others like educational and insurance status were not identified [11].

This study identified age ($p=0.041$) to be significantly associated with ART medication adherence. 20-29 years age grade adhered higher (63.0%) than other group. This may possibly be that some have younger children whom they would not want to leave make an orphan so early in life. The lowest adherence level was seen in the people of 30-39 of years. Conceivably, people in this group may not be married but desires to have a child and therefore may lack the necessary social support from spouses and children. This agrees with the findings of Mitiku et al. where those aged 20-29 years, (42.7%) had good adherence than others. The similarities between these studies may be due to same study design used.

Marital status was also found to be statistically associated ($p=0.047$) with ART medication adherence with 49.6% being married and living with partner. However, Mukosha, identified marital status as not been significantly important [12,13]. According to him, being separated reduced adherence odds to option B+ by 0.14 times when compared to married ones. Ekama, Herbertson, Addeh, & Gab-Okafor, et al was in congruence with the findings of our study that marital status is significantly associated with good adherence [9].

Diagnosis of HIV and commencement of ART

There was no association between adherence and time of diagnosis. However, participants who were diagnosed before the pregnancy, and had commenced ART before pregnancy had better adherence. This is in agreement with the systematic review of Omonaiye, Kusljic, Nicholson and Manias done in sub-Saharan Africa [14]. A cross sectional study by also identified an association between duration of ART ($p=0.019$) and good adherence [4]. Familiarity with the drugs could be the reason for this relationship.

Continuous and effective adherence counselling

Adherence counselling was one of the contributory factors of adherence, although no association was found. The findings of a qualitative study by Lumbantoruan, Kermode, Giyaia, Ang, and Kelaheer. in Papua, Indonesia is in agreement with this.

Desire to stay healthy and alive for pregnancy and existing children

Majority of the mothers expressed this motive as the main reason for adherence. This is in concomitant with the work of Deborah M. Vitalis [15]. Use of same subjects might be responsible for the similar results obtained.

Desire to protect my unborn child

This is equally one of the reasons given for adhering to medications. Although no association existed, but the findings of Buregyeya et al., and Ekama, Herbertson, Addeh, & Gab-Okafor, et al agrees with this. It represented the highest reason for adherence (51.8%) according to Ekama, Herbertson, Addeh, & Gab-Okafor, et al [9,16].

Informed by my previous PMTCT experience

This was also identified as an influential factor. Omonaiyea, Kusljicb, Nicholsona, Mohebbia, & Manias identified that those with previous exposure to PMTCT services had the odds of medication adherence as ($OR = 2.5, p = 0.005$) when compared to those without [3].

Other precipitating factor to good adherence include; desire for low viral load. However, there was no association between current viral loads (cp/ml) and medication adherence. Nevertheless, those with viral loads less than 1000cp/ml adhered better as they were motivated to see that the viral loads are been suppressed.

No association existed between gestational age, parity, and type of ART with medication adherence. However, those on Tenofovir, Lamudivine and dolutegravir (TLD) were good adherents than those on other drugs. This is possibly because TLD is only a dose therapy.

Conclusions

Just like every other protracted health issue which requires drugs, adherence is the key. But, over the years strict adherence has posed a serious public health challenge to all because of lack of universally acceptable definition for it and strict method and means of measuring it. It is always a tedious task trying to assess adherence and over the years low adherence rate to ART has been reported in sub-Sahara Africa and Nigeria. However, recent studies, from different regions, including south-South Nigeria have shown an increase. Quite a lot of factors such as busy work schedule and tiredness, forgetfulness, religious belief, side effects of drugs, stigma, and food requirement have been linked to the low rate of adherence. However, adherence rate observed in this study is good but more efforts need to be taken.

Adherence to ART cannot be over emphasized owing to its importance and benefits to the patients, the child, health care system and society at large. The influence of conjugal status and age were showed to statistically influence adherence to ARTs. Other socio-demographic factors had no statistical relationship. Busy work schedule and tiredness were the most identified cause for non-adherence just like in non-pregnant adults, while the need to keep living in a good condition for the foetus and other children was the most identified reason for adherence. Counselling by providers of health care also played a role in adherence, hence, the need for persistent counselling [17-26].

Recommendations

1. Couple-based counselling is to be encouraged in health facilities in Nigeria, with all patients receiving counselling before beginning ART.
2. Formation of HIV Support groups among pregnant women in every facility and encouraging active participation in such groups for adherence to be strengthened.
3. Volunteers, (preferably HIV patients) who would act as role models and provide care and support to other HIV patients should be trained by the Ministry of Health.
4. There should be further research to explore the issues surrounding partner support and how it affects adherence.
5. Family members not necessarily the spouse are encouraged to play the role of treatment supporters and to provide the support needed.

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