

4 **IMPROVING ADHERENCE TO ANTI-RETROVIRAL THERAPY**
5 **AMONG PERSONS LIVING WITH HIV/AIDS IN ENUGU STATE,**
6 **SOUTH EAST NIGERIA**
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11 **Abstract**

12 **Aims:** This study assessed the effect of health education on the knowledge and
13 practice of adherence to ART among persons living with HIV/AIDS in Enugu state,
14 southeast Nigeria.

15 **Study Design:** Interventional study

16 **Place and duration of study:** Anti-retroviral Therapy clinics within Enugu metropolis
17 in Enugu state Nigeria between June to December 2018.

18 **Methodology:** A health education intervention was carried out among 312 persons
19 living with HIV/AIDS receiving ART in Enugu metropolis to improve their perception and
20 adherence to antiretroviral therapy. A structured questionnaire was used to collect data
21 from 312 people living with HIV/AIDS (156 each in the study and control groups), who
22 were selected by multistage sampling. Subsequently, health education was conducted
23 among the study group. Three months after this intervention its effects were assessed
24 through a survey using the same structured questionnaires employed in the baseline
25 survey.

26 **Result:** The most frequently occurring reason given by the respondents for poor
27 adherence to ART was forgetfulness (65.4% for study and 69.9% for control groups).
28 Knowledge of the factors and consequences of poor adherence to treatment was
29 significantly higher among the study group than the controls post-interventions $p <$
30 0.001. Adherence to ART improved from 42.3% pre-intervention to 81.4% post-
31 intervention.

32 **Conclusion:** Intensive health education effectively improved adherence to ART among
33 persons living with HIV/AIDS, and this should be carried out regularly.

34 **Key words:** Adherence, Anti-retroviral therapy, health education, knowledge.
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36 **Introduction**

37 HIV/AIDS continues to be a major global public health issue, having claimed more than
38 32 million lives so far. There were approximately 37.9 million people living with
39 HIV/AIDS (PLWHA) at the end of 2018, with 1.7 million people becoming newly infected
40 in 2018 globally [1]. According to the World Health Organization (WHO) sub-Saharan
41 Africa is the most affected region with 25.7 million PLWHA in 2018, an approximate
42 70% of all PLWHA in the world [1]. The African region also accounts for almost two
43 thirds of the global total of new HIV infections. Key populations and their sexual
44 partners accounted for over half of all new infections (54%) for the first time in 2018
45 [1].

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47 The key populations include; men who have sex with men, people who inject drugs,
48 people in prisons and other closed settings, sex workers and their clients, and
49 transgender people. They are at increased risk of HIV irrespective of epidemic type or
50 local context. About 62% of adults and 52% of children living with HIV were receiving
51 lifelong antiretroviral therapy (ART) in 2018 [1]. Findings from the 2018 National HIV
52 sentinel survey shows that Nigeria, Africa's most populous nation has HIV prevalence of
53 2.0% [2].

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55 Global and international health initiatives in response to the pandemic have targeted
56 several countries, including Nigeria, for the expansion of antiretroviral therapy (ART)
57 programs for the increasing number of affected persons with funding through programs
58 such as the US President's Emergency plan for AIDS Relief (PEPFAR) and Global funds
59 to fight AIDS, tuberculosis and malaria (GFATM) [2,3]. This has resulted in the
60 expansion of treatment and prevention programs that have increased ART access to
61 previously unreachable and underserved population with resultant remarkable decrease in
62 HIV-related morbidity and mortality in the past fifteen years. ART has been found to
63 significantly improve the health, life expectancy of HIV-positive people and quality of
64 life of PLWHA [4].

65
66 The magnitude of HIV epidemic and the complexity of its chronicity represent major
67 challenges to healthcare delivery systems in developed and developing countries. The
68 large-scale effect of the AIDS epidemic in Nigeria transcends the healthcare sector and
69 impact upon virtually all aspects of the society [5]. The epidemic has further weakened
70 the already overwhelmed Nigerian health care system, by increasing the number of
71 orphans and vulnerable children and the cost of achieving set developmental goals.

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73 In resource-constrained settings where healthcare services are not well developed, poor
74 adherence to treatment and defaulting from treatment are the two major challenges
75 faced by ART programmes. Poor adherence compromises treatment effectiveness,
76 making this a critical public health issue [6]. If adherence falters, resistance to ARV may
77 develop, thus rendering the treatment regimen ineffective and possibly requiring a
78 more costly and potentially more toxic regimen change. This is one of the strongest
79 predictors of progression to AIDS and death among PLWHAs and is also associated with
80 the development of drug-resistant viral strains [7]. The resulting virological failure
81 diminishes the potential for long-term clinical success. This is a potential hazard to the

82 community because ARV-resistant strains of HIV could then be transmitted to HIV naïve
83 individuals [8,9].
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85 Antiretroviral (ARV) drugs are drugs used in the treatment of HIV/AIDS. The
86 recommended treatment for HIV/AIDS involves the use of highly active antiretroviral
87 therapy (HAART) to ensure effective reduction of viral replication [10]. It is a
88 combination of drugs acting to inhibit various steps in the HIV replication process.
89 Despite the overwhelming benefits of HAART, it is often associated with side effects.
90 Patients have been known overtime to adopt various measures to cope with drug side
91 effects [11].

92 Adherence is the act of following a course of medication in exactly the manner it was
93 prescribed. Lack of strict adherence to HAART is considered to be one of the key
94 challenges to AIDS care worldwide [12]. Inability to cope effectively with the side
95 effects of ARV results in non-adherence to medication. To be most effective, HIV
96 therapy requires a near perfect level of adherence [13]. Less than 95% adherence to
97 regimen can lead to viral resistance and ultimately treatment failure. Non adherence to
98 medications is characterized by increased morbidity, mortality and great economic loss
99 [14].

100 This study was conducted to improve the knowledge and adherence to antiretroviral
101 therapy among PLWHA receiving ART in Enugu State, South East Nigeria.

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103 **MATERIALS AND METHODS**

104 Enugu State is one of the five States in the Southeast geopolitical zone of Nigeria. The
105 State has seventeen local government areas and is bounded in the east by Ebonyi
106 State, in the West by Anambra State, the North by Kogi and Benue States and in the
107 South by Abia State. The population of the State is about 3.32 million according to the
108 2006 national population census; with a growth rate of 2.83% [15]. The inhabitants are
109 mainly of Igbo tribe and are predominantly Christians. Most of the urban dwellers are
110 civil servants, traders or artisans while rural dwellers are mainly farmers.

111 The study was an intervention study involving a before and after comparison of the
112 knowledge and ART adherence pattern of PLWHAs subjected to a 3 day intensive health
113 education training and adherence counseling on ART with those not trained. A total of
114 312 patients participated in the study; 156 in the study group and 156 in the control
115 group. A total of 4 facilities, offering ART services were selected for this study;
116 University of Nigeria Teaching Hospital, Enugu State University Teaching Hospital,
117 Annunciation Specialist Hospital and Mother of Christ Specialist Hospital. Out of the 4
118 selected ART hospitals in Enugu metropolis, 2 served as the intervention centers while
119 the other 2 served as the control centers. The study centers also were located on the
120 out sketch of Enugu metropolis while the control centers were at the heart of the town
121 again limiting the possibility of cross-interference.

122 A multistage sampling technique was applied. The sample size was proportionally
123 allocated to the facilities based on the patient's load. A systematic sampling technique
124 was then used to select participants as they presented for their clinic visits using the
125 clinic, attendance register. The questionnaire was pretested in a health facility which
126 was not selected for the main study. Ambiguities or deficiencies in the study
127 instruments were then revised.

128 Quantitative data was collected using interviewer administered semi-structured
129 questionnaires. Responses were elicited on the socio-demographic characteristics,
130 knowledge of HIV manifestations, benefits and side effects of ART, knowledge and
131 practice of adherence to ART.

132 The research was conducted in 3 phases. The first phase was a baseline data collection.
133 The second phase was a 3 day intensive health education intervention on ART and
134 adherence counseling which involved only the study group. The third phase was the
135 post health education intervention evaluation which took place after three months of
136 the intervention. The effects were assessed using the same interviewer- administered
137 questionnaires employed in the baseline study. However, at the end of the post-
138 intervention assessment, health education on HIV/AIDS transmission and adherence
139 was provided to the control group.

140 Data entry and analysis were done using statistical package for social sciences (SPSS)
141 version 22. Frequency tables and cross-tabulations were also generated. Descriptive
142 statistics, frequencies and proportions were derived for categorical variables. Chi
143 square test of statistical significance and student t-test were used in the analysis. Level
144 of statistical significance was set at predetermined P-value of < 0.05 .

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147 **RESULTS**

148 A total of 312 people living with HIV/AIDS (PLWHA) were studied, one hundred and
149 fifty six (156) each in the study and control groups.

150 The age range of the respondents was 25-44years. Majority of them were married and
151 had secondary school education. The mean age of the group was 34.1 ± 6.5 years
152 while that of the control group was 36.8 ± 9.6 years. Both the study and control groups
153 at baseline were statistically comparable ($P < 0.05$) in marital status, religion and
154 occupational characteristics.

155 However the differences observed in the age structure, sex distribution and educational
156 level between the study and control groups at baseline were statistically significant
157 ($P < 0.05$); table 1.

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165 **Table 1.Socio-demographic Characteristics of the respondents at**
 166 **baseline.**

Characteristics	Study group n = 156 N (%)	Control group n = 156 N (%)	χ^2	P-Value
Age				
Mean \pm SD	34.1 \pm 6.5	36.8 \pm 9.6	0.063*	0.950
Age in groups				
15 – 19	0(0.0)	3(1.9)	6.542	0.001
20 – 24	1(0.6)	7(4.5)		
25 – 29	33(21.2)	24(15.4)		
30 – 34	51(32.7)	40(25.6)		
35 – 39	40(25.6)	29(18.6)		
40 – 44	22(14.1)	17(10.9)		
45 – 49	7(4.5)	9(5.8)		
50 – 54	0(0.0)	16(10.3)		
55 – 60	0(0.0)	11(7.0)		
60 & above	2(1.3)	0(0.0)		
Sex				
Male	33(21.2)	57(36.5)	8.99	0.003
Female	123(78.9)	99(63.5)		
Marital Status				
Single	40(25.6)	59(37.8)	0.195	0.846
Married	88(56.4)	71(45.5)		
Widowed	17(10.9)	20(12.8)		
Divorced	11(7.1)	6(3.8)		
Educational Level				
Primary	19(12.2)	24(15.4)	4.942	0.001
Secondary	68(43.6)	69(44.2)		
Post secondary	67(42.9)	56(35.9)		
No formal education	2(1.3)	7(4.5)		
Religion				
Anglican	51(32.7)	14(9.0)	1.298	0.206
Catholic	48(30.8)	102(65.4)		
Pentecostal	43(27.6)	34(21.8)		
Others	14(8.9)	6(3.8)		
Occupation				
Civil servants	49(31.4)	56(35.9)	1.268	0.206
Trader/Business	39(25.0)	41(26.3)		
Farmers	14(9.0)	8(5.1)		
Artisan	54(34.6)	51(32.7)		

167 *student t-test

168 Table 2 shows the respondents knowledge of the nature of HIV/AIDS disease at
 169 baseline and post intervention. At baseline, over 80% of the study and control groups
 170 identified AIDS as a serious disease, that persons with HIV can still live active life and
 171 demonstrated the need for routine HIV screening during pregnancy. This was not
 172 statistically significant. However, knowledge of availability of drugs for HIV treatment
 173 was statistically significant among PLHWA in study group than those in the control
 174 group at baseline (P=0.042).

175 Post-intervention, there was increased knowledge of the nature of HIV/AIDS disease
176 among the study when compared with the control group. The difference in knowledge
177 among all variables was statistically significant.

UNDER PEER REVIEW

178 **Table 2: Respondents' knowledge of the nature of HIV/AIDS disease at baseline and post**
 179 **intervention.**

Knowledge	Baseline				Post Intervention			
	N = 156		X2	P	N = 156		X2	P
	Study b/f (%)	Control b/f (%)			Study after (%)	Control after b/f (%)		
AID is a serious disease	136(87.2)	139(89.1)	0.28	0.599	156(100.0)	140(89.7)	16.86	<0.001*
Drugs available for treatment of people with HIV	88(56.4)	70(44.9)	4.15	0.042	154(98.7)	65(41.7)	121.34	<0.001*
If a person is HIV positive, he has AIDS	46(29.5)	43(27.6)	0.14	0.707	24(15.4)	46(29.5)	8.91	0.003*
All antenatal patients should be routinely tested for HIV	125(80.1)	131(84.0)	0.78	0.376	152(97.4)	120(76.9)	29.36	<0.001*
HIV person can still live active/fulfilling life	147(94.7)	150(96.2)	0.427	0.427	156(100.0)	144(92.3)	12.48	<0.001

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181 Table 3 shows the knowledge of ART adherence among the respondents.

182 At baseline between 70%-91% of the study and control groups knew about adherence
183 and its importance. One hundred and two (65.4%) and 109(69.9%) in the intervention
184 and control groups respectively identified forgetfulness as the major cause of poor
185 adherence. Also drug resistance was identified as the major consequence of poor
186 adherence by 75 (48.1%) and 89(57.1%) of the study and control groups.

187 The difference in the baseline knowledge between the two groups was not statistically
188 significant unlike post-intervention where the study group demonstrated a highly
189 statistical significant difference ($P<0.01$) in knowledge when compared with the control
190 group.

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Table 3: Knowledge of ART Adherence Among the Respondents

Knowledge	Baseline				Post Intervention			
	Study b/f (%) N=156	Control b/f (%)N=156	X ²	P	Study after (%)N=156	Control after (%)N=156	X ²	P
- Adherence is taking drug as agreed with doctor	128(82.1)	130(83.3)	0.09	0.764	156(100.0)	129(82.7)	29.56	<0.001
Excess alcohol in-take can affect ART adherence	135(86.5)	142(91.0)	1.58	0.209	156(100.0)	140(89.7)	16.86	<0.001
Adherence determine success of ART	122(78.2)	132(84.6)	2.12	0.146	154(98.7)	132(84.6)	20.31	<0.001
Adherence counseling is necessary before starting ART	142(91.0)	139(78.8)	0.32	0.570	156(100.0)	139(78.8)	17.98	<0.001
Patient is at risk of dying from HIV/AIDS if no adherence to ART	118(75.6)	109(69.9)	1.31	0.252	155(99.4)	104(66.7)	59.12	0.001
Identify causes of poor adherence:								
Forgetfulness	102(65.4)	109(69.9)	0.72	0.397	153(98.1)	102(65.4)	55.83	0.001
Away from home	9(5.8)	16(10.3)	2.13	0.144	148(94.9)	30(19.2)	182.14	0.001
Medication exhausted	14(9.0)	20(12.8)	1.19	0.276	118.(75.8)	21(13.5)	122.08	0.001
Too many pills	17(10.9)	17(10.9)	0.00	1.000	105(67.8)	35(22.4)	63.49	0.001
Drug side effects	19(12.2)	28(17.9)	2.03	0.154	108(69.2)	42(26.9)	55.93	0.001
Knowledge of consequences of poor adherence:								
Drug resistance	75(48.1)	89(57.1)	2.52	0.112	140(89.7)	101(64.7)	27.73	0.001
Treatment failure	34(21.8)	40(25.6)	0.64	0.425	152(97.4)	39(25.0)	172.38	0.001
Increased risk of death	55(35.3)	57(36.5)	0.06	0.813	154(97.4)	63(40.4)	118.50	0.001
Risk of wanderer infections	43(27.6)	49(31.4)	0.55	0.456	143(91.7)	52(33.3)	113.24	0.001
Illness may worsen	67(42.9)	63(40.4)	0.21	0.646	147(94.2)	67(42.9)	95.21	0.001

203 Table 4 shows prevalence of ART adherence among the respondents.
204 At baseline, 66 (42.3%) and 58(37.1%) of the study and control groups respectively
205 took their ART daily as prescribed with no statistically significant difference.
206 Post intervention, the number of respondents that took their ART daily for 30 days (a
207 month) as prescribed improved significantly ($P<0.001$) for the study group (81.2%)
208 when compared with the control group (32.1%).

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UNDER PEER REVIEW

Table 4: Prevalence of ART Adherence among the respondents.

Number of days ARVs were taken per month	Pre-intervention (N=156)				Post-intervention (N = 156)			
	Study group (%)	Control group (%)	X ²	P-value	Study group (%)	Control group (%)	X ²	P-value
30 days	66(42.3)	58(37.1)	0.86	0.355	127(81.2)	50(32.1)	77.43	0.001
10 days	20(12.8)	23(14.7)	13.56	0.000	9(5.8)	20(12.8)	4.60	0.032
4 days	34(21.8)	30(19.2)	0.315	0.576	8(5.2)	33(21.2)	17.50	0.001
2 days	23(14.8)	6(3.8)	10.99	0.001	6(3.8)	30(19.2)	18.09	0.001
1 day	13(8.3)	19(12.2)	1.25	0.263	6(3.8)	23(14.7)	10.99	0.001

214 **Discussion**

215 At baseline the study and control groups differed in their mean age, educational level
216 and sex distribution. The most frequent age range in the study group was 25-44years
217 corresponding to the sexually active age group mostly affected by HIV/AIDS.

218 The female respondents largely out-numbered the male respondents. This finding is in
219 line with the WHO survey study which showed that HIV/AIDS infection among females
220 in sub-Sahara Africa outnumbered that of males, were the national prevalence values
221 are estimated using women on antenatal clinic [16,17,18]. The finding may also be an
222 indication that women are assessing ART services more than men and are becoming
223 more open about the disease than men [19,20].

224 The study group improved significantly in their knowledge and awareness of nature of
225 HIV/AIDS, post-intervention unlike the control group. This could be because the study
226 group received intensive training and health education intervention on the nature of
227 HIV/AIDS disease, ART and adherence counseling unlike the control group.
228 Approximately 45% and 37% of the respondents in the study and control groups
229 respectively attained 100% adherence pre-intervention. This is in contrast to the finding
230 among AIDS patients receiving HAART in Botswana where about 77% of the
231 respondents attained 95% adherence rate [21].

232 The adherence level required to ensure effective HIV/AIDS therapy is 95% as levels
233 lower than this are associated with poor viral suppression, therapeutic failure and rapid
234 disease progression [22]. Post-intervention, the study group had a great improvement
235 in adherence as 81.4% attained 100% adherence as against 32%.1% in the control
236 group. This finding is an indication that appropriate health education intervention is
237 capable of improving adherence to ARV drugs among HIV/AIDS patients. This is similar
238 to previous finding were there was significant higher adherence in the group that
239 received health education [23].

240 The factors identified by both groups that supported their adherence were attendance
241 at counseling sessions, effectiveness of ART, and membership of HIV/AIDS support
242 group. The finding of this study supports previous study where health education,
243 membership of a support group, fixed drug combination and less adverse effects were
244 found to improve adherence [24]. The groups also identified long hospital waiting
245 period, multiple ARV drugs, side effects, finance and forgetfulness as the limiting factors
246 to their adherence to therapy. Other research studies similarly reported these factors as
247 among those limiting adherence to ART [25].

248 The major source of adherence support identified by the respondents in this study is
249 the doctor or primary physician. This is not unexpected as doctors are the closest allies
250 for the patients. Other social supporters including the family members were less
251 utilized. Studies have shown that involvement of relatives, friends, family and
252 community members in supporting the patients are beneficial in improving and
253 maintaining adherence [26,27].

254 **Conclusions and Recommendations**

255 This study has demonstrated that intensive health education to persons living with
256 HIV/AIDS on the nature of the disease, its management and the benefits of ART is the
257 most appropriate means to ensure and improve treatment adherence.

258 It is therefore recommended that all persons living with HIV/AIDS receive regular
259 intensive health education training, and that relatives and friends are involved in
260 patient's treatment.

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262 **COMPETING INTERESTS**

263 Authors declare that no competing interests exist.

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