



ORIGINAL ARTICLE

Health Literacy and Adherence to Care by People Living with Human Immune Deficiency Virus (PLWHIV) in Nasarawa State

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ABSTRACT

Keywords

Health literacy;

Adherence;

Human Immune-deficiency Virus

Background: Adherence to care among people living with the Human Immunodeficiency Virus (PLWHIV) has become a serious concern for healthcare practitioners. This study aimed to determine the health literacy (HL) and level of adherence to care among PLWHIV in Nasarawa State.

Methodology: This was a cross-sectional study conducted on 396 HIV patients accessing antiretroviral therapy in Nasarawa State from June to July 2023. Two pretested interview-administered questionnaires were used to collect data on HL and adherence to care. Data entry and analysis were done using IBM Statistical Package for Social Science (SPSS) version 25.0. Descriptive statistics were used to describe respondent's characteristics. Categorical variables were reported as frequencies and percentages. The association of HL domains with the level of adherence to care was determined using F-stat.

Results: The dimensions of health literacy, including feeling understood and supported by healthcare providers, the ability to actively engage with healthcare providers, and navigating the healthcare system, were found to be significantly associated with the age of the respondents ($p < 0.05$). High health literacy and a good level of adherence to care were found in 65.7% of the population. Adherence to care was significantly associated with HL, age, level of education, and marital status ($p < 0.05$).

Conclusion: The level of adherence to care by PLWHIV in Nasarawa State is significantly associated with HL. To enhance treatment adherence, healthcare professionals should boost the HL of PLWHIV in Nasarawa State by providing clearer and more accessible health information to patients during clinic visits.

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INTRODUCTION

The adherence to care among those living with the Human Immunodeficiency Virus (HIV) has become a public health concern across Africa,

with particular emphasis on Nigeria, over the past decade.^{1,2} The term "adherence" encompasses the entirety of the process involved in selecting, initiating, and effectively

maintaining a specific therapy regimen aimed at controlling the replication of HIV and enhancing immune system functionality.³ Adherence rates for individual patients are typically expressed as a percentage, representing the proportion of prescribed care dosages that were taken by the patient within a specified timeframe.^{4, 5} There is currently no universally agreed-upon criterion for determining what qualifies as sufficient adherence. Nevertheless, certain studies reported adherence rates over 80% as satisfactory, while others reported rates of 95% and more as essential for appropriate adherence, especially among patients with severe diseases such as human immunodeficiency virus infection.⁶ Prior studies conducted in Africa have demonstrated a medication adherence rate of approximately 77.0% and 77.8% among HIV-positive individuals.^{7, 8} Antiretroviral therapy (ART) medication adherence rates in Nigeria have been reported as 54.0% at Aminu Kano Teaching Hospital Kano⁹ and 62.6% at Federal Medical Center Makurdi.¹⁰ The observed inadequate adherence to ART is anticipated to present significant challenges for the management and containment of the HIV/AIDS pandemic in Nigeria.

In recent times, there has been a report of poor adherence to ART medication in Nasarawa state, despite the available antiretroviral medications.¹¹ Nigeria, which ranks third in Sub-Saharan Africa in terms of HIV infection burden, faces the challenge of achieving

optimal treatment adherence to prevent the emergence and transmission of HIV drug-resistant strains.¹² To prevent this consequence and prolong life, there is a need to pursue successful therapy. This requires a treatment adherence rate of at least 95%, which is crucial for suppressing viral replication and preventing the emergence of drug resistance.⁸

The Nasarawa state government and various non-governmental organizations have undertaken multiple initiatives aimed at enhancing the rate of adherence to treatment among people living with HIV (PLWHIV) within the state. This initiative entails several components, including the expansion of the supply of antiretroviral drugs, the improvement of access to healthcare services, and the implementation of enhanced monitoring strategies, such as home visits and care. The aforementioned efforts have yielded minimal or negligible gains in boosting the level of compliance.¹¹ According to existing reports, there is evidence suggesting that individuals with inadequate health literacy face challenges in comprehending medical recommendations.¹³ The effectiveness of adherence to care strategies is dependent on the health literacy (HL) level of the individual receiving care.^{14, 15} Limited HL has been suggested as a potential contributory factor to ineffective management of long-term diseases, non-adherence to treatment plans, and poor treatment outcomes.^{16, 17} This study aimed to determine health literacy (HL) and level of adherence to care by PLWHIV in Nasarawa State.

Table 1: Distribution of Socio-demographic Characteristics of the Respondents

Variables	Frequency (N=396)	Percent
Age		
10-19	12	3.0
20-29	96	24.2
30-39	156	39.4
40-49	95	24.0
50+	37	9.3
Sex		
Male	108	27.3
Female	288	72.7
Occupation		
Farming	217	54.9
Business	93	23.5
Civil servant	48	12.2
Student	34	8.6
Driving	2	0.5
Housewife	1	0.3
Religion		
Christianity	247	62.4
Islam	145	36.6
Traditional	4	1.0
Marital Status		
Never married	52	13.1
Married	267	67.4
Divorced	33	8.3
Widowed	44	11.1
Educational Status		
No formal education	100	25.3
Primary	112	28.3
Secondary	99	25.0
Tertiary	85	21.5

METHODS

Study Location

The study was conducted in Nasarawa State which is located in the north-central geopolitical zone of Nigeria. Antiretroviral therapy services are typically available through government-owned healthcare facilities, such as public hospitals and primary healthcare centers, as well as through private healthcare providers. The National Agency for the Control of AIDS (NACA) is the federal agency responsible for coordinating the response to

HIV/AIDS in Nigeria. The agency collaborates with Nasarawa State government and some non-governmental organizations to ensure easy accessibility of antiretroviral drugs to PLWHIV.¹²

Study Design

This was a quantitative, cross-sectional study among HIV patients accessing ART in Nasarawa State conducted from June to July 2023.

Study Population

The population of the study was PLWHIV who were registered and accessing ART in Nasarawa State.

Inclusion Criteria

PLWHIV who consented to participate in the study, had been receiving ART for a minimum of three months, and were not currently on admission to a healthcare facility were included in the study.

Exclusion criteria

Individuals with co-morbidities such as tuberculosis, Diabetes Mellitus, Hypertension, mental disorders, hepatitis, or any other medical conditions whose medications may interact with the antiretroviral drugs were excluded.

Sample Size

The minimum sample size (n) for the research was determined using Yamanes' formula:¹⁸ $N/1+N(e)^2$. The variables in the equation are defined as follows, N represents the population size of registered PLWHIV in the three selected antiretroviral clinics in Nasarawa state, and e represents the level of precision. Hence, substituting the variables in the formula $n = 50468 / (1 + 50468 \times 0.0025)$. The calculated minimum sample size was 396.

Sampling Technique

The researchers used a multi-stage sampling technique to select the respondents. The initial stage includes the selection of one Local Government Area (LGA) from each senatorial district through the simple random technique of

balloting. Akwanga, Awe, and Keffi LGA were selected to represent Northern, Southern, and Western senatorial districts, respectively.

Stage two involved the selection of ART facilities from each of the three chosen LGAs. A list of ART facilities in Akwanga, Awe, and Keffi LGA was made, and one ART facility was selected from each of the local government areas using the simple random technique of balloting.

In stage three respondents were selected from the ART facilities. The number of respondents from each of the ART facilities was drawn based on proportionate allocation. Therefore, 132, 125, and 139 respondents were drawn from Akwanga, Awe, and Keffi LGAs respectively. A list of the registered patients accessing ART in each of the three selected facilities was collected from the antiretroviral clinic registry to serve as a sampling frame. The sampling interval was obtained by dividing the total population of each clinic by the allocated sample size. So, every nth patient was recruited for the study based on the serial arrangement of the list.

Instrument for Data Collection

Two questionnaires were used for data collection: A pretested structured questionnaire designed by the researchers was used to collect information from PLWHIV on socio-demographic characteristics, including the respondents' age, occupation, marital status, religion, educational attainment, and adherence to care. The second was the "Health Literacy Questionnaire" (HLQ), which was adopted.^{19, 20}

The HLQ had a total of 44 items, which were distributed across nine distinct Domains. It was used to assess the HL level exhibited by the participants. The questionnaires were interview-administered to the respondents during their clinic visits.

Pretesting

Two experts validated the instruments to ascertain the extent to which the variables were relevant to the study's objectives. Thereafter the instruments were pre-tested on PLWHIV in Kofa Hausa Healthcare Center Keffi, a facility not selected for the study. The response provided helped to address any form of ambiguity in the questions. The Cronbach's alpha coefficient of both were within 0.78-0.82 indicating an acceptable internal consistency.

Measurement of Outcome variables

The first questionnaire assessed adherence to antiretroviral therapy among the participants through a series of questions. These questions used a four-point ordinal scale, allowing respondents to express their level of agreement by selecting one of the four response options: strongly disagree, disagree, agree, or strongly agree. The allotted ratings for each question ranged from 1 to 4, with 1 representing severely disagree, 2 representing disagree, 3 representing agree, and 4 representing highly agree. A Medication Adherence Report Scale was used to determine the tiers of adherence where the scores are calculated, converted into percentages, and classified into three tiers: good (80-100%), fair (50-79%), and poor (< 50%).²¹

The HLQ assessed the Domains of HL. Each scale corresponds to a distinct domain within the broader construct of HL. The domains were categorized as follows: (i) Experiencing a sense of understanding and support from healthcare providers; (ii) Possessing adequate information to effectively manage one's health; (iii) Actively taking responsibility for one's health; (iv) Receiving social support for maintaining good health; (v) Evaluating the quality of health information received; (vi) Engaging actively with healthcare providers; (vii) Navigating the complexities of the healthcare system; (viii) Accessing reliable sources of health information; and (ix) Comprehending health information well enough to make informed decisions. Each domain consists of a range of four to six items. The initial five domains were assessed using a four-point ordinal scale (strongly disagree, disagree, agree, and highly agree), wherein participants were required to indicate their degree of agreement by selecting one of the four response options. Domains 6-9 consist of scales that measure self-reported capability. Within these domains, items were evaluated using a five-point ordinal answer scale, ranging from "cannot do" to "very easy." To determine the HL of an individual, each domain score was calculated independently by using the mean scores of the related items. There is no overall total score for HL as the domains are not combined. This method of analysis is in tandem with the guidelines for analyzing and reporting data from the HL questionnaire and has been used by several other researchers.

The full HL section of the questionnaire provides nine individual scores based on an average of the items within each of the nine domains. There is no overall total score for the HL as that could potentially mask individual needs in specific health literacy domains.²²⁻²⁶

Data Analysis

Statistical Package for Social Sciences (SPSS) version 25.0, developed by IBM Corporation was used to conduct both descriptive and inferential analyses. The study respondents' characteristics were described using frequency tables. The chi-square or Fischer's exact tests were utilized to analyze categorical variables, while the F-test was used to assess the statistical significance of the association between health literacy domains and levels of adherence to care. Health literacy domains that had a significance level of ≤ 0.05 were considered to be associated with adherence.

Ethical Consideration

Ethical approval for the study dated 7th May 2023 was obtained from the Research and Ethical Committee of the Nasarawa State Ministry of Health Lafia (NSMH/ERC PAN/2023/07/010). Respondents who were 18 years and above were required to sign a written informed consent form before participating in the study. Assent was obtained from respondents who were less than 18 years and written informed consent was obtained from their parents. Participation in the study was voluntary and participants were assured that there would be no victimization of anyone who

did not want to participate or who decided to withdraw after giving consent.

RESULTS

A total of 396 HIV patients who met the criteria for the study were surveyed. The age distribution of respondents ranged between 10 and 55 years, about two-thirds (66.6%) of the respondents were below 40 years of age, 72.7% were female and 54.9% were farmers as occupation. About 67.4% of the respondents were married and living with their spouses, and a high proportion (91.7%) of the respondents had some formal education. **Table 1**

Table 2 shows the mean scores of health literacy domains among the respondents and their age in all nine domains. Health literacy domains one, six, and seven (feeling understood and supported by healthcare providers, ability to actively engage with healthcare providers, and navigating the healthcare system) were significantly associated with the age of the respondent's domains with p-values of <0.001 , <0.001 , and 0.029 for scales one, six, and seven respectively. The table also shows a consistent increase in mean scores of HL domain one (feeling understood and supported by healthcare providers) as the age increases. Furthermore, the mean score of respondents in domain six increased steadily from ages 20 and above.

According to the data presented in table three, 65.7% of the respondents had good adherence to care, 11.1% of the respondents had a fair level of adherence and 23.2% had a poor level of adherence to care. Age, marital, and

educational statuses were found to be significantly associated with levels of adherence to care (P-value <0.001, <0.001, and

0.002 for age marital, and educational statuses respectively). **Table 3**

Table 2: Mean HL Domains of Respondents According to Age

Domains	Age	Mean score (SD)	Min score	Max score	F-stat.	P-value
1. Feeling understood and supported by healthcare providers	10-19	3.3125 (0.7160)	1.75	4.00	13.524	<0.001
	20-29	3.4714 (0.4320)	2.00	4.00		
	30-39	3.7003 (0.3969)	2.75	4.00		
	40-49	3.8000 (0.3212)	2.75	4.00		
	50+	3.8716 (0.3516)	2.75	4.00		
2. Having sufficient information to manage my health	10-19	3.3125 (0.2638)	3.00	3.75	1.387	0.238
	20-29	3.3047 (0.3308)	2.50	4.00		
	30-39	3.3125 (0.3665)	2.25	4.00		
	40-49	3.3816 (0.3069)	2.25	4.00		
	50+	3.4257 (0.4443)	1.75	4.00		
3. Actively managing my health	10-19	3.3500 (0.2713)	2.80	3.80	0.455	0.769
	20-29	3.3063 (0.3243)	2.80	4.00		
	30-39	3.3551 (0.3296)	2.60	4.00		
	40-49	3.3537 (0.2967)	2.80	4.00		
	50+	3.3189 (0.2807)	2.80	4.00		
4. Social support for health	10-19	3.0500 (0.5054)	2.60	4.00	2.059	0.085
	20-29	3.1000 (0.4794)	2.00	4.00		
	30-39	3.0141 (0.6857)	1.80	8.80		
	40-49	2.9695 (0.4920)	2.20	4.00		
	50+	2.7946 (0.4095)	2.00	3.80		
5. Appraisal of health information	10-19	3.3167 (0.3761)	2.40	3.80	0.602	0.662
	20-29	3.1896 (0.3993)	2.00	4.00		
	30-39	3.2321 (0.3373)	2.00	4.00		
	40-49	3.2526 (0.3090)	2.20	4.00		
	50+	3.2162 (0.3954)	2.00	4.00		
6. Ability to actively engage with a healthcare provider	10-19	4.3833 (0.7056)	2.60	5.00	9.810	<0.001
	20-29	4.1932 (0.6667)	2.80	5.00		
	30-39	4.5327 (0.5815)	2.60	5.00		
	40-49	4.6484 (0.5692)	2.60	5.00		
	50+	4.7730 (0.5520)	2.80	5.00		
7. Navigating the healthcare system	10-19	4.0267 (0.6471)	2.33	4.83	2.730	0.029
	20-29	3.9911 (0.6500)	2.17	5.00		
	30-39	4.2012 (0.5198)	2.33	5.00		
	40-49	4.1854 (0.5009)	2.17	5.00		
	50+	4.2562 (0.6816)	1.67	5.00		
8. Ability to find good health information	10-19	3.8833 (0.3663)	3.20	4.40	0.478	0.752
	20-29	3.7542 (0.6360)	2.00	5.00		
	30-39	3.8391 (0.5392)	2.40	5.00		
	40-49	3.8211 (0.5445)	2.00	5.00		
	50+	3.8703 (0.5910)	2.00	5.00		
9. Understanding health information well enough to know what to do	10-19	3.6500 (0.5728)	2.80	4.80	0.991	0.412
	20-29	3.4896 (0.7160)	1.80	5.00		
	30-39	3.5853 (0.6355)	1.60	5.00		
	40-49	3.6758 (0.5879)	1.80	5.00		
	50+	3.5730 (0.7748)	1.80	5.00		

Table 4 shows the association between health literacy domains and respondents' adherence levels to care. Health literacy domains (1-8) have a significant association with the grouped level of adherence to care among PLWHIV in Nasarawa State. However, understanding

health information well enough to know what to do as a component of health literacy was not significantly associated with the level of adherence to care among PLHIV in Nasarawa State (P= 0.075).

Table 3: Distribution of Socio-demographics and Adherence Level

Variables	Grouped Adherence Score			Total (%)	df	χ^2	P-value
	Good level	Fair level	Poor level				
Age							
10-19	3(25.0)	5(41.7)	4(33.3)	12(3.0)	8	48.552	<0.001
20-29	43(44.8)	16(16.7)	37(38.5)	96(24.2)			
30-39	108(69.2)	17(10.9)	31(19.9)	156(39.4)			
40-49	73(76.8)	6(6.3)	16(16.8)	95(24.0)			
50+	33(89.2)	0(0.0)	4(10.8)	37(9.3)			
Total	260(65.7)	44(11.1)	92(23.2)	396(100.0)			
Gender							
Male	73(67.6)	12(11.1)	23(21.3)	108(27.3)	2	0.324	0.850
Female	187(64.9)	32(11.1)	69(24.0)	288(72.7)			
Total	260(65.7)	44(11.1)	92(23.2)	396(100.0)			
Marital status							
Never married	17(32.7)	11(21.2)	24(46.2)	52(13.1)	6	37.057	<0.001
Married	183(68.5)	26(9.7)	58(21.7)	267(67.4)			
Divorced	21(63.6)	5(15.2)	7(21.2)	33(8.3)			
Widowed	39(88.6)	2(4.5)	3(6.8)	44(11.1)			
Total	260(65.7)	44(11.1)	92(23.2)	396(100.0)			
Educational status							
No formal education	69(69.0)	11(11.0)	20(20.0)	100(25.3)	6	21.037	0.002
Primary	88(78.6)	7(6.2)	17(15.2)	112(28.3)			
Secondary	62(62.6)	11(11.1)	26(26.3)	99(25.0)			
Tertiary	41(48.2)	15(17.6)	29(34.1)	85(21.5)			
Total	260(65.7)	44(11.1)	92(23.2)	396(100.0)			

DISCUSSION

The study population had high health literacy, as evidenced by the elevated mean values seen across all HL domains. Other studies have also shown that patients with chronic disease conditions always manifest high health literacy levels.^{27,28} This may be connected to the fact that people with chronic illnesses often have more interactions with healthcare providers and access to educational materials that can help

improve their HL. Besides, a good proportion of the respondents possess some level of formal education as previous studies have demonstrated a substantial association between educational attainment and HL in patient populations.^{29,30,31}

A statistically significant association was found between certain HL domains and the age groups of the respondents in domains one, six, and seven. These domains include feeling

understood and supported by healthcare providers, the ability to actively engage with healthcare providers, and navigating the healthcare system. The study revealed an association between age and health literacy in domain one. This suggests that as individuals grow older, their perception of being understood and supported by healthcare providers tends to improve. A similar relationship was reported in other study populations, indicating that the perception of being understood and supported by healthcare practitioners increases with age.^{27,13}

Another noteworthy finding among the population was the steady increase in mean scores of respondents in domain six from the age of 20 and beyond. This finding indicates that there is increase development in the capacity of individuals as they attain the age of 20 years and above to actively interact with healthcare providers. This phenomenon could potentially be attributed to the inherent naivety and lack of experience commonly observed among teenagers, which may consequently hinder their willingness to actively participate in conversations with healthcare professionals regarding their health condition however, when they outgrow the teenage period, they can actively become inquisitive hence engage with a healthcare provider to know more about their health. The study revealed that at the age of 20 years and beyond, there is a notable increase in the mean score of HL domain seven (navigating the healthcare system). This means that the process of understanding, accessing, and utilizing healthcare services and resources

effectively may increase when individuals have attained the age of 20 years.

Furthermore, the findings of the study indicated that a significant proportion of the participants, specifically 65.7%, demonstrated good adherence to their prescribed treatment regimen. The observed proportion is found to be below the recommended 95%, as has been documented in various other regions.^{8,32} The rate of adherence among the population, despite the presence of antiretroviral drugs in healthcare facilities, can be linked to the inadequate provision of continuous training for treatment adherence counselors. The present study additionally discovered an association between the age of the participants and their adherence to care. The majority of respondents who showed high levels of adherence to care fell within the age range of 30-49 years, in contrast to individuals who were younger or older than this age bracket. This finding aligns with the findings reported in Ilorin, north-central Nigeria where a significant association between patients' age and adherence to care among those living with HIV was reported.^{33, 34}

Level of education was significantly associated with treatment adherence among the respondents. Individuals who lack formal education or have only completed primary education demonstrate higher levels of adherence to care compared to those who have completed secondary and tertiary education. This finding differs from the result of a previous study conducted in Ilorin, Kwara State, which observed that individuals with higher levels of education showed higher levels of treatment

adherence due to their enhanced understanding of the condition and treatment regimen.³ The variance observed might be attributed to the fact that the majority of the respondents in the current study are farmers and businessmen who probably have demanding job schedules that take away their attention from their medications. A statistically significant association was seen between marital status and adherence. Higher proportions of patients with good adherence levels were married. This finding is supported by a study in Ilorin, north-central Nigeria where it was reported that support from a spouse could reduce psychological stress and financial burden, especially in an environment where the extended family system is practiced.³

Furthermore, feeling understood and supported by healthcare providers, having sufficient information, active management of health, social support, appraisal of health information, ability to actively engage with a healthcare provider, navigating the healthcare system, and the ability to find good health information are all significantly associated with adherence to care. The report aligns with the findings of other previous studies.³⁵⁻³⁷ This finding indicates that limited HL can lead to inadequate knowledge of medication efficacy, poor self-management of care, low health outcomes, as well as unwillingness to ask both healthcare professionals and informal caregivers for help in managing health conditions.

Table 4: HL Domains and Grouped Adherence Levels of Respondents

Health Literacy Domains	Grouped Adherence Mean (SD)			F-stat	P-value
	Good level	Fair level	Poor level		
1. Feeling understood and supported by healthcare providers	3.8333 (0.3169)	3.5568 (0.4171)	3.2717 (0.4037)	89.945	<0.001
2. Having sufficient information to manage my health	3.4377(0.2625)	3.3068 (0.4274)	3.0707 (0.3875)	46.017	<0.001
3. Actively managing my health	3.3356 (0.3115)	3.5000 (0.3327)	3.2783 (0.2904)	7.749	0.001
4. Social support for health	2.9835 (0.6119)	3.2636 (0.3994)	2.9478 (0.4888)	5.260	0.006
5. Appraisal of health information	3.2605 (0.2748)	3.3636 (0.3058)	3.0739 (0.4967)	13.966	<0.001
6. Ability to actively engage with a healthcare provider	4.7337 (0.4287)	4.4580 (0.4344)	3.8457 (0.7141)	103.449	<0.001
7. Navigating the healthcare system	4.3217 (0.3717)	4.1707 (0.4547)	3.6410 (0.7722)	62.732	<0.001
8. Ability to find good health information	3.8900 (0.4701)	3.9591 (0.3157)	3.5543 (0.7845)	14.426	<0.001
9. Understanding health information well enough to know what to do	3.6188 (0.5880)	3.6773 (0.5125)	3.4543 (0.8665)	2.604	0.075

CONCLUSION

Even though the population has a high level of health literacy, the proportion of respondents with good levels of adherence was below the recommended threshold.

Recommendations

Given the association between health literacy and adherence to care within this population, enhancing adherence to the recommended threshold necessitates that healthcare professionals should utilize plain, non-technical language to provide educational interventions that are aimed at enhancing the health literacy of PLWHIV.

Limitations

Our study has some limitations. The cross-sectional design is not able to establish causality. In addition, there could be confounding factors that are difficult to ascertain using a survey approach. However, this research is useful in guiding future research on adherence to care among PLWHIV.

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Author's Contributions: Conceptualization of the study, design, literature review, data analysis, and results interpretation were done

by RTK, EC, and DH. Manuscript preparation and editing were carried out by RTK. All authors read the final draft before submission.

REFERENCES

1. Chime OH, Ndibuagu EO, Orji CJ. Rates and predictors of adherence and retention for antiretroviral therapy among HIV-positive adults in Enugu, Nigeria. *Malawi Med J.* 2019 Sep 1;31(3):202–211 doi: 10.4314/mmj.v31i3.7
2. World Health Organisation, author. *Towards universal access: scaling up priority interventions in the health sector; progress report.* Geneva: WHO; 2007. [Accessed 01st February 2023]. Available at: https://www.who.int/hiv/mediacentre/universal_access_progress_report_en.pdf
3. Anyaike C, Atoyebi OA, Musa OI, Bolarinwa OA, Durowade KA, Ogundiran A *et al.* Adherence to combined Antiretroviral therapy (cART) among people living with HIV/AIDS in a Tertiary Hospital in Ilorin, Nigeria. *Pan African Medical Journal.* 2019; 32:10. doi:10.11604/pamj.2019.32.10.7508
4. Federal Ministry of Health. National Tuberculosis and Leprosy Control Programme; Department of Public Health. Worker's Manual. 5th Edition 2018; 42.
5. Claxton AJ, Cramer J, Pierce CA. A systematic review of the associations between dose regimens and medication compliance. *Clinical Therapy.* 2001; 23 (8): 1296-310. DOI: 10.1016/s0149-2918(01)80109-0
6. Osterberg L, Blaschke T. Medication adherence. *N Engl J Med.*2020; 353(5): 487-497. DOI: 10.1056/NEJMra050100
7. Dlamini PS, Wantland D, Makoae LN, Kohi TW, Greeff M, Naidoo J *et al.* HIV stigma and missed medication in HIV-positive people in five African countries.

- AIDS Patient Care STDs*.2019; 23(5): 377-389. DOI: 10.1089/apc.2008.0164
8. Bangsberg DR, Hecht FM, Charlebois ED, Zolopa AR, Holodniy M, Sheiner L., et al Adherence to protease inhibitors, HIV-1 viral load, and development of drug resistance in an indigent population. *AIDS*.2000; 14(4): 357-366. doi: 10.1097/00002030-200003100-00008.
 9. Iliyasu Z, Kabir M, Abubakar IS, Babashani M, Zubair ZA. Compliance to antiretroviral therapy among AIDS patients in Aminu Kano Teaching Hospital, Kano Nigeria. *Nigerian J Med*.2005; 14(3): 290-294.
 10. Shaahu VN, Lawoyin TO, Sangowawa AO. Adherence to highly active antiretroviral therapy (cART) at a Federal Medical Centre. *Afr J Med Sci*.2018; 37(1): 29-36. PMID: 18756852
 11. Chukwu EO, Ojedokun JP, Azihaiwe AN, and Chukwu J. Adherence to Medical Treatments Among HIV/AIDS Positive Patients Attending Antiretroviral Therapy Clinics in Nasarawa State, Nigeria. *Texila International Journal of Clinical Research*, 2019; Special Edition, 2019. DOI:10.21522/TIJCR.2014.SE.19.02.Art001
 12. Federal Ministry of Health. National Guidelines for HIV and AIDS Treatment and Care in Adolescents and Adults. Federal Ministry of Health Abuja, Nigeria. 2017; 1-4.
 13. Jarahi L, Asadi R, Hakimi, HR. General Health literacy assessment of Iranian women in Mashhad. *Electronic physician*, 2017; 9(11), 5764–5769. <https://doi.org/10.19082/5764>
 14. Abel E, Painter L. Factors that influence adherence to HIV medications: perception of women and health care providers. *J Association Nurses. AIDS Care*. 2013;14(4): 61-69. Doi: 10.1177/1055329003252879.
 15. Malcom S, Ng JJ, Rosen RK, Stone VE. An examination of HIV/AIDS patients who have excellent adherence to HAART. *AIDS Care*. 2003; (15)2: 251-261. Doi: 10.1080/0954012031000068399
 16. Reynolds R, Smoller S, Allen A, Nicholas, PK. Health Literacy and Health Outcomes in Persons Living with HIV Disease: A Systematic Review. *AIDS and behavior*. 2019; 23(11): 3024–3043. <https://doi.org/10.1007/s10461-019-02432-9>
 17. Palumbo R. Discussing the Effects of Poor Health Literacy on Patients Facing HIV: A Narrative Literature Review. *International journal of health policy and management*. 2015; 4(7): 417–430. <https://doi.org/10.15171/ijhpm.2015.95>
 18. Adam AM. Sample Size Determination in Survey Research. *Journal of Scientific Research & Reports*.2020 26(5): 90-97. DOI: 10.9734/JSRR/2020/v26i530263
 19. Osborne RH, Batterham RW, Elsworth GR, Hawkins M., Buchbinder R. The Grounded Psychometric Development and Initial Validation of the Health Literacy Questionnaire (HLQ) *BMC Public Health*. 2013;13:658. doi: 10.1186/1471-2458-13-658
 20. Budhathoki SS, Hawkins M, Elsworth G, Fahey MT, Thapa J, Karki S, et al. Use of the English Health Literacy Questionnaire (HLQ) with Health Science University Students in Nepal: A Validity Testing Study. *Int J Environ Res Public Health*. 2022, 19(6): 3241. doi: 10.3390/ijerph19063241
 21. Chan AH, Horne R, Hankins M, Chisari C. The Medication Adherence Report Scale: A measurement tool for eliciting patients' reports of nonadherence. *Br J Clin Pharmacol*. 2020. 86(7): 1281–1288. doi: 10.1111/bcp.14193
 22. Osborne RH, Batterham RW, Elsworth GR, Hawkins M, Buchbinder R. The grounded psychometric development and initial

- validation of the Health Literacy Questionnaire (HLQ). *BMC Public Health*. 2013; 13(1):658. <https://doi.org/10.1186/1471-2458-13-658>
23. Australian Bureau of Statistics. The National Health Survey: health literacy, 2018, Cat. No. 4364.0.55.014. Canberra: ABS; 2019.
 24. Elsworth GR, Beauchamp A, Osborne RH. Measuring health literacy in community agencies: a Bayesian study of the factor structure and measurement invariance of the health literacy questionnaire (HLQ). *BMC Health Serv Res*. 2016;16(1):508. <https://doi.org/10.1186/s12913-016-1754-2>
 25. Fry JM, Antoniadis J, Temple JB, Osborne RH, Cheng C, Hwang K et al. Health literacy and older adults: Findings from a national population-based survey. *Health Promot J Austral*. 2023;1–17. <https://doi.org/10.1002/hpja.779>
 26. Dodson S, Good S, Osborne RH. *Health Literacy Toolkit for Low- and Middle-Income Countries: A Series of Information Sheets to Empower Communities and Strengthen Health Systems*; World Health Organisation, Regional Office for South-East Asia: Delhi, India, 2014. [Accessed on 15th November 2023] available at: <https://www.who.int/publications/i/item/9789290224754>
 27. Tavousi M, Haeri-Mehrzi A, Rakhshani F, Rafiefar S, Soleymanian A, Sarbandi F et al. Development and validation of a short and easy-to-use instrument for measuring health literacy: the Health Literacy Instrument for Adults (HELIA). *BMC Public Health*. 2020; 20(1): 656. <https://doi.org/10.1186/s12889-020-08787-2>
 28. Haghghi ST, Lamyian M, Granpaye L. Assessment of the level of health literacy among fertile Iranian women with breast cancer. *Electronic physician*. 2015; 7(6): 1359–1364. <https://doi.org/10.14661/1359>
 29. Brandstetter S, Atzendorf J, Seelbach-Göbel B, Melter M, Kabesch M, Apfelbacher C. KUNO-Kids study group. Socio-demographic factors associated with health literacy in a large sample of mothers of newborn children: cross-sectional findings from the KUNO- Kids birth cohort study. *European journal of pediatrics*. 2020; 179(1): 165–169. <https://doi.org/10.1007/s00431-019-03483-9>
 30. Cindi KY, Shumate L, Barnett SH, Leitman IM. Health literacy Assessment and patient Satisfaction in surgical practice. *Annals of Medicine and Surgery*. 2018; 25:25-28. <https://doi.org/10.1016/j.amsu.2018.08.022>
 31. Komenaka IK, Nodora JN, Machado L, Hsu CH, Klemens AE, Martinez ME et al.. Health literacy assessment and patient satisfaction in surgical practice. *Surgery*, 2014; 155(3): 374–383. <https://doi.org/10.1016/j.surg.2013.10.011>
 32. Paterson DL, Swindells S, Mohr J, Brester M, Vergis EN, Squier C et al. Adherence to protease inhibitors therapy and outcome in patients with HIV infection. *Annals of Internal Medicine*. 2000; 133(1): 21-30. <https://doi.org/10.7326/0003-4819-133-1-200007040-00004>.
 33. Bello SI. HIV/AIDS Patients' Adherence to Antiretroviral Therapy in Sobi Specialist Hospital, Ilorin, Nigeria. *Global Journal of Medical Research*. 2011; 11(2):7-14. [Accessed on 23rd October 2023]. Available at: <https://api.semanticscholar.org/CorpusID:27086365>
 34. Salami AK, Fadeyi A, Ogunmodede JA, Desalu O. Factors influencing adherence to antiretroviral medication in Ilorin, Nigeria. *Journal of International Association of Physicians in AIDS Care*. 2010; 9(3): 191-

195.

<https://doi.org/10.1177/1545109710368722>

35. Menendez ME, van Hoorn BT, Mackert M, Donovan EE, Chen NC, Ring D. Patients With Limited Health Literacy Ask Fewer Questions During Office Visits with Hand Surgeons. *Clinical orthopedics and related research*. 2017; 475(5): 1291–1297. <https://doi.org/10.1007/s11999-016-5140-5>
36. Nachegea JB, Morroni C, Zuniga JM, Schechter M., Rockstroh J, Solomon S et al HIV treatment adherence, patient health literacy, and health care provider-patient

communication: results from the 2010 AIDS Treatment for Life International Survey. *Journal of the International Association of Physicians in AIDS Care (Chicago, Ill.* 2012; 11(2): 128–133. <https://doi.org/10.1177/1545109712437244>

37. Federman AD, Wolf M, Sofianou A, Wilson EA, Martinenko M, Halm EA et al. The association of health literacy with illness and medication beliefs among older adults with asthma. *Patient Educ Couns*. 2013; 92(2):273–278. <https://doi.org/10.1016/j.pec.2013.02.013>