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A Survey of Voluntary Counselling and Testing Service Uptake in HIV Prevalent Region in Nigeria

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Abstract Background: Voluntary counselling and testing has always been one of the HIV prevention and treatment techniques. Its awareness and knowledge have been well documented in most studies. High level HIV/AIDS related awareness and knowledge as well as that of VCT have not been translated into optimum utilization of VCT especially in HIV highly prevalent regions. However, this study examined the associated factors that correlate with VCT uptake among sexually active adults in Taraba State, one of Nigeria's HIV most prevalent states. Method: The study consists of participants randomly drawn from five local government areas of Taraba State. Four hundred questionnaires were administered to obtain responses on level of VCT utilization, HIV-related awareness and knowledge, VCT-related awareness and knowledge, as well as other associated factors. Uptake of VCT was considered as the outcome variable with dichotomous response. Relationships between demographic characteristics and baseline factors against the outcome variable were cross-tabulated using Chi-square. Also, a multiple logistic regression analysis was performed to determine associated factors which have significant effects on VCT uptake. Results: Our findings showed a very low VCT utilization level (40.9%) relative to the awareness level (97.7%). Results also showed that all the six factors considered in the study except one are statistically associated with VCT uptake at 0.05 level of significance. Conclusion: It is concluded that high level of awareness does not transcend to high utilization of VCT in the region, and effort must be intensified to improve update of HCT in the grossly affected areas.

Keywords HIV/AIDS, VCT, HCT Utilization, Chi-Square, Logistic Regression

1. Introduction

Voluntary counselling and testing (VCT) is an HIV intervention strategy in which people willingly opt for counselling and testing (CT). This avail them the opportunity to understand hiding facts about HIV/AIDS. Through counseling and testing, they receive emotional support and assurance of identity protection, contrary to their perceived wrong notions about HCT kits and handlers. Apart from being an entry point to knowledge acquisition, intervention and prevention of HIV/AIDS, HCT also helps in information management. In terms of HIV prevention, posttest counselling sessions are an opportunity to provide education, and to promote strategies for reducing the risk of HIV transmission among sexually active adults [1,2]. More also, with the current upgrade of HCT across the globe, it has become a gateway dispensary for antiretroviral therapy (ART), where infected individuals easily receive medical treatment or referral [3].

Nigeria's national HIV prevalence of HIV among persons within the reproductive age (15-49 years) has recently witnessed a declination from 2.8% to 1.4% [4]. Despite the reduction, the status still implies that about 1.9 million within this category are still living with HIV/AIDS. Moreover, the reduction in the prevalence could be attributed to the scaling up of HIV prevention services and significant efforts through HCT. Prevalence of HIV/AIDS varies across the 36 states in Nigeria. Taraba state is among the top four with a prevalence of 2.9% while Akwa Ibom top the chart with 5.5% and Kaduna and Jigawa have the least with 0.3% [5].

A study by Menna et al. [6] applied multivariate logistic regression to assess the relationship between some salient variables against attitudinal approach towards HIV related outcomes among residents of Addis Ababa, after controlling for demographic factors. Also, [7] used binary logistic approach to assess the HIV counselling and testing (HCT) in Nigeria, while [8] studied VCT-related knowledge and awareness in relation to cost implications among undergraduates in some institutions in Enugu State, Nigeria. The researches by [9,10] applied a univariate and multivariate logistic regression to quantify the effect of factors affecting HIV and breast cancer diagnosis respectively.

The United Nation's report on HIV/AIDS world-wide affirmed that the projection of eradication of avoidable transmission has witnessed a setback and it is an indication that the year 2020 target for curbing the menace is far from being achieved [4]. However, this has further been devastated by the emergence of covid-19 in the latter part of the year 2019. Consequently, deaths resulting from HIV/AIDS related issues have been escalating concurrently with the surge in covid-19. Over 500,000 HIV-induced deaths in the Sub-Saharan Africa is alarming. The return is evident in the mortality recorded around the year 2008 in the region.

To reduce the existing prevalence rate, in order to achieve the target, VCT services have been available in nearly all government funded hospitals and health care facilities through the creation of VCT sites [4]. However, the existence of these sites has not addressed the high prevalence rate of HIV/AIDS cases reported in some regions of sub-Saharan Africa, in which Nigeria is no exception. The magnitude of HIV infection among sexually active adults in such regions remains unknown since not all these cases are reported due to lack of VCT uptake in Nigeria. Also, many studies on VCT uptake have reported little or nothing about the assessment of factors associated with VCT uptake in HIV most prevalent regions. This work therefore considers the assessment of some factors associated with the uptake of VCT services among people living in some HIV prevalent regions of Taraba State, with the aim of finding prevalence rate of utilization or uptake level as well as factors that are significantly associated with the VCT uptake.

2. Methods

2.1. Design, Population and Data Collection

This is a cross-sectional study on the utilization of VCT among some strategically selected settings in Taraba State, Nigeria. Taraba is an agrarian state in the northern part of Nigeria. It is one of the states with the highest prevalence of HIV in Nigeria. The data used in this work are primary data. They were collected by a well-structured questionnaire, administered randomly to sexually active individuals (15-45 years) across five local government areas out of the sixteen LGAs in the state. The regions selected are Wukari, Zing, Bali, Jalingo and Gashaka. These regions were selected by simple random sampling technique and respondents were approached purposefully due to their relatively large populations. The questionnaire consists of three sections, namely demographic variables, HCT knowledge and awareness factors, and HCT utilization or uptake levels.

The study population included men and women within the reproductive age who willingly consented to take part in the survey.

2.2. Ethical Considerations

The principle of confidentiality was optimally ensured during and after the data collection. Moreover, participants consented to have read and understood the purpose of the research, and the data collected were strictly used for the same purpose. Issues like data falsification, plagiarism and double submission were also completely avoided.

2.3. Data Analysis and Model Specification

Preliminarily, the distributions of the various variables in the data were analyzed based on frequencies and percentages. The association between the perceived risk factors and VCT utilization was investigated with a univariate chi-square analysis. However, VCT uptake was considered as the outcome variable with dichotomous responses (if an individual uptakes VCT=1 and if otherwise= 0) and x_i 's are predictors (factors associated with VCT uptake). Since the outcome variable is dichotomous in nature, a binary multiple logistic regression model of the following order was applied to assess the influence of the predictors (associated factors) on VCT uptake.

$$L_i = \ln\left(\frac{P_i}{1-P_i}\right) = \beta_0 + \beta_1 X_1 + \cdots + \beta_k X_k \qquad (1)$$

Where $P_i = \begin{cases} P(Y_i = 1), \text{Probability that an individual voluntary uptakes VCT services} \\ P(Y_i = 0), \text{Probability that an individual does not uptake VCT services} \end{cases}$

And L_i is called the logit (log of odds ratio).

Since L_i is not linearly related to x_i 's, the OLS (ordinary least square) assumption is violated and hence the OLS could not be used. The maximum likelihood method was then used to obtain the unknown parameters $\beta_0, \beta_1, \ldots, \beta_k$.

The x_i's are variables tested for association with VCT uptake, namely HIV-related knowledge and awareness, behavioral factors, psychosocial factors, cultural factors, health service factors, wealth index and economic related factors. These factors were generated from fundamental questions in the questionnaire through principal component analysis (PCA) with eigenvalue greater than one as a criterion.

The maximum likelihood estimation MLE was used to fit the model to the data by assuming a random sample of *n* observations and letting Y_i denote the probability p that Y_i= 0 or 1, the joint probability of getting the y_i values, i.e., $f(Y_1, Y_2 \ldots, Y_n)$ is given as

$$f(Y_1, Y_2 \ldots, Y_n) = \prod_1^n f_i(Y_i) = \prod_1^n P_i^{y_i}(1 - P_i)^{1 - Y_i} \quad (2)$$

2.4. Model Adequacy Assessment and Goodness of Fit

The estimated model was assessed for adequacy using some goodness-of-fit measures and tests of association. Test of association and goodness-of-fit measures will be achieved by Pearson's Chi-square or deviance statistic and any pseudo R-square, respectively.

Pearson's Chi-square statistic is given by

$$X^2 = \sum\sum \frac{(O_{ij} - E_{ij})2}{E_{ij}} \quad (3)$$

Where O_{ij} = the observed frequencies, E_{ij} = the expected frequencies.

The commonly used pseudo R-square for testing association between the link function and the predictors is

$$\text{NagelKerke's } R^2\text{: } R_N{}^2 = \frac{R_{CS}^2}{1 - L(B^{(0)})^{\frac{2}{n}}} \quad (4)$$

Where L(β) is the log-likelihood function for the model with the estimated parameters and L $(\beta^{(0)})$ is the log-likelihood with just the thresholds, and n is the number of cases. Analysis of the data was carried out with the IBM SPSS (version 20.0).

3. Results

A total of 400 respondents were interviewed across the selected settings. Of the participants, 397 consented, with an attrition rate of only 0.25%. The sample consists of 189 (47.6%) males and 208 (52.4%) females while the majority of the study population were in their active reproductive years (15 to 45 years). The population is dominated by Hausa extraction (n=245, 85.5%) followed by Igbo (n=39, 9.8%) and Yoruba has the least (n=16, 4%). Also, the participants are predominantly Christians (n = 245, 61.4%) and married (n=263, 66.2%). In addition, most of the participants possessed secondary school education (n=205, 51.4%), and largely rural dwellers (n=257, 61.7%). Also, more than half of the respondents are either government employees (n=111, 28.0%) or self-employed (n=112, 28.2%).

Table 1. Assessment of HIV/AIDS-Related Awareness, Knowledge and Perceptions

s/n	Variables	Yes	No
1	Have you ever heard of HIV/AIDS?	389(97.7%)	9(2.3%)
2	Have you ever done an HIV/AIDS screening test?	196(49.5%)	200(50.5%)
3	Have you ever heard of HCT?	163(41.2%)	233((58.8%)
4	Have you ever voluntarily attended HCT service?	162(40.9%)	234(59.1%)
5	Do you know your HIV/AIDS status?	201(50.6%)	196(49.4%)
6	Do you think HIV/AIDS is a major threat to people's status?	353(89.1%)	43(10.9%)
7	Do you think physically healthy-looking person can have HIV/AIDS?	321(81.7%)	72(18.3%)
8	Do you think HIV/AIDS can be transmitted through sexual intercourse with an infected person?	388(97.5%)	10(2.5%)
9	Can a person get HIV infection through kissing?	10(2.5%)	388(97.5%)
10	Do you think HIV can be transmitted in pregnancy if the mother is infected?	394(99.2%)	3(0.8%)
11	Do you think HIV can be transmitted to infants during breastfeeding if the mother is infected?	396(99.7%)	1(0.3%)
12	Do you think HIV can be transmitted during delivery if the mother is infected?	366(92.7%	29(7.3%)
13	Do you think HIV can be transmitted by shaking hands with an infected person?	15(3.8%)	380(96.2%)
14	Do you think HIV can be transmitted by sharing sharp objects with an infected person?	374(94.7%)	21(5.3%)
15	Do you think HIV can be transmitted by receiving blood from an infected person?	351(89.1%)	43(10.9%)
16	Can HIV be transmitted through coughing/sneezing by an infected person?	54(13.6%)	342(86.4%)
17	Does using condom reduce the risk of having HIV?	342(90%)	138(10%)
18	Is HIV/AIDS curable?	87(22%)	308(78%)
19	Can a person contact HIV from a mosquito bite?	27(6.8%)	368(93.2%)

Table 2. Awareness/Knowledge of HCT and Voluntary Uptake of HCT versus Demographic variables

	Section A			Section B		
Variable	**Adequate knowledge of HIV/AIDS?**			**Ever voluntarily Utilized HCT?**		
	Yes	**No**	**P-value**	**Yes**	**No**	**P-Value**
Sex						
Male	184(97.4)	5(2.6)	0.742	78(41.7)	109(58.3)	0.838
Female	203(98.1)	4(1.9)		84(40.60)	123(59.4)	
Age						
15-24	52(96.3)	2(3.7)	0.560	28(28.3)	71(71.7)	0.002
25-34	44(95.7)	2(4.3)		35(35.7)	63(64.3)	
35-44	56(98.2)	1(1.8)		61(48.4)	65(51.6)	
45 or above	41(100.0)	0(0.0)		38(52.8)	34(47.2)	
Tribe/Ethnicity						
Yoruba	16(100)	0(0)	0.004	4(25.0)	12(75.0)	0.005
Igbo	38(97.4)	1(2.6)		25(64.1)	14(35.9)	
Hausa	333(97.9)	7(2.1)		133(39.3)	205(60.7)	
Others	2(66.7)	1(33.3)		0(0.0)	3(100.0)	
Religion						
Christianity	239(97.6)	6(2.4)	0.918	106(43.4)	138(56.6)	0.588
Islam	130(97.7)	3(2.3)		49(37.1)	83(62.9)	
Traditional	18(100)	0(0)		6(33.3)	12(66.7)	
Others	2(100)	0(0)		1(50.0)	1(50.0)	
Marital Status						
Single	84(95.5)	4(4.5)	0.199	37(42.0)	51(58.0)	0.383
Married	259(98.9)	3(1.1)		101(38.7)	160(61.3)	
Separated	26(96.3)	1(3.7)		13(50.0)	13(50.0)	
Divorce	17(94.4)	1(5.6)		10(55.6)	8(44.4)	
Education level						
No formal edu	36(92.3)	3(7.7)	0.016	7(17.9)	32(82.1)	<0.001
Primary edu	70(95.9)	3(4.1)		19(26.0)	54(74.0)	
Secondary edu	204(100)	0(0)		107(53.0)	95(47.0)	
Vocational edu	38(97.4)	1(2.6)		14(35.9)	25(64.1)	
Tertiary edu	41(95.3)	2(4.7)		15(34.9)	28(65.1)	
Residence						
Urban	138(98.6)	2(1.4)	0.502	54(38.8)	85(61.2)	0.312
Rural	249(62.9)	7(2.7)		107(42.0)	148(58.0)	
Occupation						
Employed	105(95.5)	5(4.5)	0.006	43(39.1)	67(60.9)	0.011
Self-employed	111(99.1)	1(0.9)		43(38.4)	69(61.6)	
Unemployed	93(97.9)	2(2.1)		30(31.6)	65(68.4)	
Schooling	75(100.0)	0(0.0)		43(58.1)	31(41.9)	
Others	3(75)	1(25)		2(50.0)	2(50.0)	

As shown in Table 1, the distributions of respondents with respect to HIV-related issues were assessed. Most of the participants (97.7%) had heard about HIV/AIDS prior to the interview but only 196 (about 50%) of them had been tested in one way or the other. On the contrary, 163 (41.2%) agreed to have heard of HCT while 162 (40.9%) of them had voluntarily utilized HCT. A little above half (50.6%) of the participants had actually identified their HIV status despite the fact that a good number of the participants 353 (89.1%) were aware that HIV could be a threat to people's well-being.

Table 2 shows a test of the relationship between the respondents' demographic characteristics and their level of awareness/knowledge about HIV/AIDS as well as voluntary uptake of HCT. All the tested factors are categorical in nature. Therefore, inference was made based on Pearson's Chi-square test except for sex and place of residence, which have binary options, where Fisher's exact test was reported. That is, all (100%, in section A) the high school students among the participants had a better level of awareness and more than 50% (Section B) of them had voluntarily taken up the HCT prior to the encounter.

The percentage of female respondents with adequate awareness/knowledge of HIV/AIDs was slightly higher than that of male respondents. Unlike the voluntary uptake of HCT which higher among male participants than their female counterparts as shown above (Table 2, Section B), but their level of association could not be statistically substantiated as the P-values are greater than 0.05 in both cases. This implies that gender is not significantly associated with voluntary uptake of HCT. Similarly, there is not enough evidence that age is significantly associated with the awareness/knowledge of HIV/AIDs. Nevertheless, utilization of HCT increases with age and the relationship is significant at 5% (P= 0.002). As displayed in Section A and B, ethnicity has significant association with the level of awareness/knowledge of HIV/AIDS and voluntary uptake of HCT, with p-values 0.004 and 0.005, respectively. The results of the cross-tabulations also show that none of the tested variables is associated with religion, marital status and place of residence. Interestingly, awareness/knowledge status and voluntary utilization of HCT are quite significantly associated with the level of education attained and types of occupation. It worths noting that those in secondary school are more exposed to both factors than other categories.

Assessment of VCT Uptake Using Binary Logistic Regression Analysis

A knowledge score was computed via the mean scores of the respondents' HCT knowledge assessment. Each correct answer attracts one (1) mark and incorrect scored zero. Overall, a mean score of 0.48±0.12 is estimated for the study population on knowledge and awareness of HCT. A score above the mean value was recorded as a high score, or otherwise, low.

In addition, Principal Component Analysis was employed to reduce sectional associated factors in the questionnaire in order to avoid redundancy of predictors in the model. Items with an eigenvalue of 1 or greater as demarcated by the sharp corner of the Scree plot in Figure 1 were extracted for the formulation of the components. Hence, knowledge scores on voluntary HCT, cultural factors, health service factors, psychosocial factors, behavioral factors and wealth index/economic related barriers are considered for further scrutiny as potential voluntary HCT associated factors. The results are presented and interpreted as follows:

After controlling for age categories of the respondents, ethnicity, level of education and their nature of occupation, the odds ratio (OR) for knowledge score among the respondents is 2.86 (95% CI: 1.372, 5.961) which is significant (i.e. p-value = 0.005 < 0.05) as shown in Table 3. This implies that the odd of up-taking HCT voluntarily among individuals with high knowledge/awareness of VCT is 2.86 times more likely than their counterparts with low knowledge or awareness. However, other tested factors have negative coefficients, meaning they are risk factors for VCT uptake rather than being protective. For instance, individuals with negative perception or bad behavioral factor towards HCT are 93.7% (1-OR) less likely to uptake VCT compared with those with contrary opinion. Also, participants who had wealth index and economic related barriers are 69.5% less likely to uptake VCT than others. Nevertheless, health service factors cannot significantly (OR = 0.542, 95% CI: 0.249, 1.182) explain uptake of VCT since its p-value = 0.124 (> 0.05). The fitness of the model was assessed using the Hosmer-Lemeshow statistic. A p-value greater than 0.05 indicates a good model fit.

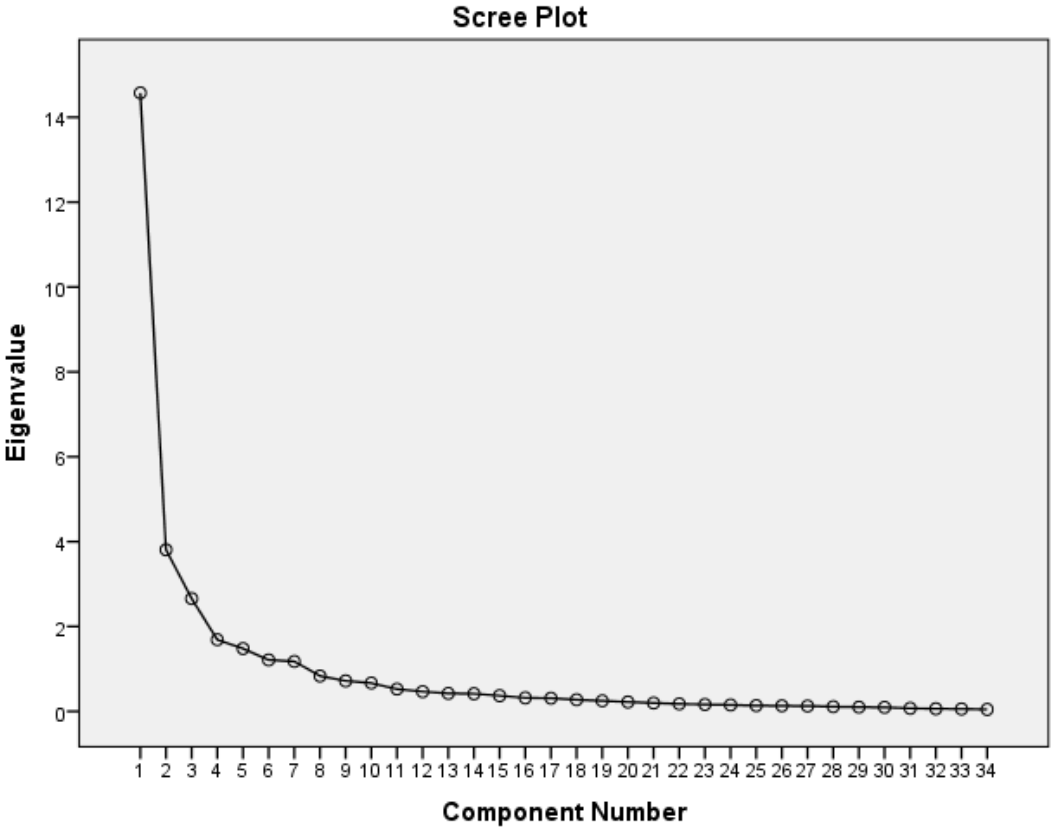

Figure 1. Variables extraction by CPA

Table 3. Predictors of HCT Uptake using a Multiple Binary Logistic Regression (BLR)

	β	*S.E.*	*Wald*	*df*	*Sig.*	*exp(β)*	*95% C.I.forexp(β)*	
							Lower	Upper
Knowledge and awareness about HCT	1.051	.375	7.861	1	.005	2.860	1.372	5.961
Negative perception or behavioral tendency	-2.765	.502	30.363	1	.000	.063	.024	.168
Cultural believe	-.814	.402	4.110	1	.043	.443	.202	.973
Assumption of poor health services	-1.819	.395	21.151	1	0.248	.162	.075	.352
Psychosocial issues	-2.410	.479	25.268	1	.000	.090	.035	.230
Low wealth index or economic factors	-1.187	.417	8.117	1	.004	.305	.135	.690
Constant	6.021	.823	53.569	1	.000	411.990		

[Nagelkerke R square value = 0.752, it follows that 75.2% of variations in the model is explained by the variables in the model]

4. Discussion

This study investigated voluntary uptake defining factors in Taraba State, a north-eastern part of Nigeria with a high HIV prevalence rate. In order to achieve sustainable development goal on the eradication of transmission of new cases of HIV and minimizing the scourge among those living with the disease, a research on awareness and uptake of VCT such as this one has become expedient, particularly in HIV prevalent regions like Taraba State, where there is an upward trend of HIV prevalence. This is very necessary to compliment effort on adherence with ART [11]. The awareness level is impressive and it is quite higher than what was reported for some other settings like Abuja suburb-46.7%, South Africa-83% Sagamu-78.6% [12-14]. Unfortunately, the high level of awareness or knowledge of HIV/AIDs does not translate to adequate knowledge about some salient features peculiar with HIV etiology and transmission mode as the knowledge score is (0.48±0.1) out of one.

Moreover, our findings reveal that there is a definite lacuna between HIV/AIDS and VCT nomenclatures as more responses were reported for HIV/AIDS awareness and screening. Though the procedure for VCT might be

bypassed for unusual cases during blood transfusion, it could explain the missing gap. More so, about half (50.6%) of the population knew their HIV status. This is a little bit lower than the reported figure (53.6%) in another study conducted in other areas like Ethiopia [15-17]. Interestingly, some technical questions were answered correctly. For instance, the majority believed that a physically fit person can still have HIV/AIDS and that HIV can be transmitted through other means rather than sexual intercourse. This shows that people are aware of some fundamental mode of HIV transmission. Therefore, the reasons for the short fall in the respondents knowing their HIV status may be attributed to some other hidden factors.

Findings on univariate analysis reveal that gender is not associated with awareness of VCT. This is contrary to the report from another research in Ghana by [18] where age, ethnicity, highest level of education and occupation are significantly related to VCT uptake. Awareness is critical to utilization. This could be deduced from our findings since background factors influencing awareness also affect VCT uptake. This is a pointer to areas where intensive advocacy is mostly needed, sequel to the control of upsurge in HIV transmission and also to buffer the effect of burden on those living with HIV within the populace since Anti-retroviral therapy ART is now available within almost every settlement. Prior knowledge and awareness of HCT has a positive effect on uptake of VCT. This resonates with the previous research, carried out in Tanzania [19]. Awareness of VCT should be extended to proper education in many areas where there are misconceptions about HCT. For instance, many do not believe that the service is free. Therefore, they hide under financial inadequacies to remain unaware of their HIV status.

The estimated BLR model fit provided information on the suitability of the model for the assessment of VCT uptake-related factors. Knowledge/awareness, behavioral factors, cultural factors, psychological factors and wealth index/economic factors are significant predictors of VCT uptake, while health service factors do not significantly predict VCT uptake.

5. Conclusions

Despite the fascinating level of awareness of HCT (strategies) displayed by the participants, the proportion of voluntary users of HCT service is still very low. Unemployment, lack of adequate educational background, tender age and lower level of awareness among Yoruba and Hausa tribes in the locality are observed as risk factors for voluntary HCT uptake. The impediments identified in the current research border on low knowledge and awareness of VCT, psychosocial resistance to HIV host, health services on the part of HCT handlers, cultural and wealth index/economic related issues.

The estimated BLR model indicated that all the six factors except health service factors are statistically significant. It follows that knowledge/awareness of HCT, psychosocial factors, cultural factors, behavioral factors and economic indexes are statistically associated with VCT uptake. However, only the knowledge has a positive inference on VCT uptake, the other five factors are risk factors for VCT uptake owing to the negative signs of their parameters. A very high pserdo R^2 value (due to Nagelkereke) and five significant factors (variables) highlight an overall goodness of fit of BLR and lead to the conclusion that the BLR is suitable for assessing VCT uptake in Taraba state. It was concluded that there exists a high level of awareness about HCT services in Taraba state while the rate (40.9%) of utilization was low and unimpressive when compared to the awareness level (97.7%)

However, results of the analyzed responses showed that only knowledge has a positive influence on the uptake of VCT services. Other factors have negative effects and constitute risk factors for VCT. All the factors except health service factors are statistical significant at 0.05 level of significance.

6. Recommendations

Considering the findings of this work, the need for sustenance of existing level of knowledge and awareness of VCT (and other HCT strategies) among the populace is suggested. Efforts should also be geared towards translation of high level of awareness and knowledge into high uptake. This may be achieved by making testing a routine scheme rather than voluntary, thereby making the users more acquainted with the process and encouraging voluntary attendance.

To address primitive cultural practices, sex education should be provided to sexually active populace through the creation of adolescent centres in rural areas in order to eradicate cultural behaviours capable of deterring VCT among rural dwellers. Also, comprehensive health education strategies targeted at sexually risky class of individuals as well as provision of sexual protective devices in public places will help address the behavioral factors militating against VCT uptake among the populace, especially the youths.

Strengthening HCT facilities through the acquisition of modern day equipment as well as regular training (and re-training) of health workers is also suggested, in order to break the health service barriers militating against the high VCT uptake. Trust in test outcomes as well as confidentiality is the cardinal concept of medical ethics. Emphasizing the implications of a lack of confidence in health workers and their impact on intending voluntary users of HCT would go a long way in keeping the worker abreast of professionalism. Finally, a combination of mental health counselling with HCT strategies will help to address psychosocial factors and help to improve HCT uptake among mentally troubled individuals.

Conflicts of Interest

Authors declare there are no conflicts of interest regarding the publication of this work.

Authors' Contribution

OYH conceived the research idea and designed the methodology. TIH and SOA supervised the collection of the data and reviewed necessary literatures. OFO and TOO performed the data analysis and discussed the results while TWA wrote the manuscript. All authors perused and approved the final manuscript.

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