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Qualitative Reduction of World Health Organization Quality of Life Questionnaires

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ABSTRACT: The study proposed a reduced World Health Organization Quality of Life (WHOQoL (BREF)) questionnaire with 19 variables by combining the WHOQoL (BREF) questionnaire with the World Health Organization Quality of Life-Human Immunodeficiency Virus (WHOQoL-HIV (BREF) questionnaire using binary logistic regression. Sensitivity and specificity tests were carried out as diagnostic accuracy to measure the level of agreement between the results of a test under evaluation and that of the reference standard. The proposed questionnaire gave a positive predictive value (PPV) and a negative predictive value (NPV) that are as good as the gold standard for measuring quality of life using real life data. A detailed analyses with significant odd ratios for the proposed instrument was reported.

Keywords: Binary logistic, Sensitivity, Specificity, Odd ratio, Quality of life

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INTRODUCTION

Human immunodeficiency virus (HIV) is an associate of a set of viruses called retroviruses. Acquired immune deficiency syndrome (AIDs) has a chronic devastating course and as such, determining the impact on the quality of life (QoL) of people living with HIV/AIDs (PLWHA) is important for estimating the burden of the disease (Wig *et al*., 2006). Globally, HIV/AIDS infection is one of the primary causes of mortality amongst young adults. Data on the number of PLWHA globally stands at 38 million of which 36.2 million were adults and 1.8 million were children under fifteen years old (WHO (2020), UNICEF (2020), HIV.gov (2020)) and Nigeria has the second utmost number of HIV diseased people in the world (Mabayoje and Akinleye (2016)).

Quality-of-life research has led to the recognition of the significance of quality of life and the need to integrate quality of life into health care exercise (Grossman *et al*., 2003). Clinicians, researchers, policy makers, pharmaceutical establishments, and patients have all come to identify the impact of quality of life. Subsequent to the acceptability of QoL as a multidimensional theory that is best estimated by a number of different concealed concepts such as physical function, health status, mental status and social relations (Lee *et al*., 2005), QoL therefore includes overall independent feelings of well-being that are closely linked to morale, happiness and satisfaction. Health is generally quoted as one of the most important factors of overall quality of life and it has been recommended that quality of life may be exclusively affected by specific disease process such as AIDS (Friedland *et al*., 1996). Given the longevity attainable with the modern prophylactic and therapeutic policies for PLWHA, quality of life has emerged as an important measure of health outcome and quality of life improvement as an important goal (Mofolorunsho, 2013; Bachmann, 2006; Douaihy and Singh, 2001). Several instruments for determining QoL have been established and described (McDowell and Newell, 1996). Longer version evaluates QoL comprehensively while shorter version is most

suited for busy clinics. WHOQoL BREF -a generic instrument could be used in general population to measure a wide range of domains applicable to a variety of health states, conditions and diseases (Elisabete *et al*., 2007). The strength of the WHOQoL-HIV BREF instrument used among HIV/AIDs patient has also been recognised (Saxena *et al*., 2002). The WHOQoL-HIV has been authenticated across different cultures and settings round the world (WHOQoL-HIV, 2004). The cross-cultural validation of the instrument is in view of the widely reported cultural variations and limitations of health related quality of life (HRQOL) instruments (Collinge *et al*, 2002; Tchen *et al*, 2003; Jeff *et al*, 2013). The WHOQoL model and questionnaire were developed in multiple cultures in both developing and developed countries and designed to be culturally sensitive and take into consideration the subjective well-being of the individual. The WHOQoL-HIV questionnaire was found to be valid and reliable in Zambia (Mweemba *el at*., 2011). Also, the size of the current WHOQoL-HIV questionnaire does not allow its usage in routine patient care. Nevertheless, limited researches have been carried out using specifically the WHOQoL-HIV (BREF) rightly in Nigeria. Many researchers have used the instrument for non HIV patients that is WHOQoL (BREF) on HIV patients, hence the need to incorporate the two instruments into each other and still have reliable results. Thus, researchers can freely use the instrument for any group of patients. Secondly, filling a lengthen questionnaire could be arduous for any one especially in developing countries and since the responses from the questionnaire goes a long way in determining the quality of life of the people and policy making by the health sectors, therefore the need for a reduced questionnaire.

MATERIALS AND METHODS

Materials

The tools used were the WHOQoL-HIV (BREF) and WHOQoL (BREF). WHOQoL BREF is an all-purpose instrument that could be recycled in universal population to assess a wide range of areas applicable to a variety of health states, situations and diseases (Elisabete *et al*., 2007). WHOQoL-HIV (BREF) has six domains, with additional 2 variables for the total QoL and general health, giving a total of 31 variables. While, WHOQoL (BREF) has four domains, also with 2 variables for the overall QoL and general health to make a total of 26 variables. The 26 variables that are common to both instruments are as follows: qb1 - Quality of life rating; qb2 - Satisfaction with your health; qb3 - Pain & discomfort; qb5 - Dependence on medication or treatment; qb6 - Positive feelings; qb7 – SRPB: Spirituality, Religion and Personal Believe; qb11- Thinking, learning, memory & concentration; qb12 - Physical safety & security; qb13- Physical environment-pollution; qb14- Energy & Fatigue; qb15- Body image & appearance; qb16- Financial resources; qb18- Opportunities for acquiring new information & skill; qb19- Participation in recreation/leisure activities; qb20- Mobility; qb21- Sleep & rest; qb22- Activities of daily living; qb23- Work capacity; qb24- Self-esteem; qb25- Personal relationships; qb26- Sexual activity; qb27- Social support; qb28- Home environment; qb29- Health & social care: accessibility & quantity; qb30- Transport; qb31- Negative Feelings. The mean score of items within each domain is used to calculate the domain scores compatible with the scores used in WHOQoL-100 and subsequently transformed to a 0-100 scale. Domain scores were scaled in a positive direction with higher scores denoting higher QoL. Each variable was rated on a 5 point scale where 1 indicates low, negative perception and 5 indicates high, positive perception.

Study Area and Data Collection

This work was ratified by the Ethical Review Committee of Ondo State Ministry of Health (AD 4693/79) and Ekiti State University Teaching Hospital, Ado-Ekiti Ethics and Research Committee (EKSUTH A 67/2014/02/004).

Akure is a city in the South West area of Nigeria, and is the largest city and capital of Ondo State. The city has a population of approximately 387,087. The people are of the Yoruba ethnic group. Ekiti State is also in the South West of Nigeria. The state was carved out of the old Ondo State. It covers the former twelve Local Government Areas that made up the Ekiti Zone of old Ondo State. Ado-Ekiti is the state capital of Ekiti State. It occupies about 293 Square Kilometres (km^2) with a population of approximately 424,340 (Worldometers, 2017).

The data used in this study are primary data collected by direct interview and filling of the WHOQoL-HIV (BREF) questionnaire by 564 PLWHA attending Haematology/Virology clinic at University of Medical Sciences Teaching Hospital, Akure (UNIMEDTH) and Ekiti State University Teaching Hospital, Ado-Ekiti (EKSUTH). The relative or control data were also collected by interview and filling of WHOQoL (BREF) questionnaire by 806 non-infected persons. A descriptive, cross-sectional study of 1,370 persons was conducted among PLWHA and non- infected persons using the WHOQoL BREF and the WHOQoL-HIV BREF questionnaires.

Theoretical Framework

A binary logistic regression model is used to predict the probabilities of a discrete outcome when the dependent variable is dichotomous. That is, it only contains data coded as 1 with probability of success π(x) or 0 with a probability of failure 1-π(x), while the independent variable may be continuous, discrete or categorical.

The logistic regression model is of the form:

$$Z_i = \log\left(\frac{\pi_i}{1-\pi_i}\right) \qquad (1)$$

Where $\pi_i$is probability that i^{th} case experiences the event of interest.

Z_i is value of the unobserved continuous variables for i^{th} case.

The model assumes Z to be linearly related to the predictors in the form

$$Z_i = b_0 + b_1x_{i1} + b_2x_{i2} + \cdots + b_jx_{ij} \qquad (2)$$

Where x_{ij} is j^{th} predictor for j^{th} case.

b_j is j^{th} coefficient

Since Z is unobserved, we relate the predictors to the probability of interest by substituting for Z.

$$\pi_i = \frac{1}{1+e^{-(b_0+b_1x_{i1}+\cdots+b_jx_{ij})}} \qquad (3)$$

Model Specification

x terms $x_1, x_2 \ldots x_i$ are the independent variables, some of which may be interaction terms.

For this study, $x_1 = q_{b1}$; $x_2 = qb_2$; $x_3 = qb_3$; $x_4 = qb_5$; $x_5 = qb_6$; $x_6 = qb_7$; $x_7 = qb_{11}$; $x_8 = qb_{12}$; $x_9 = qb_{13}$; $x_{10} = qb_{14}$; $x_{11} = qb_{15}$; $x_{12} = qb_{16}$; $x_{13} = qb_{18}$; $x_{14} = qb_{19}$; $x_{15} = qb_{20}$; $x_{16} = qb_{21}$; $x_{17} = qb_{22}$; $x_{18} = qb_{23}$; $x_{19} = qb_{24}$; $x_{20} = qb_{25}$; $x_{21} = qb_{26}$; $x_{22} = qb_{27}$; $x_{23} = qb_{28}$; $x_{24} = qb_{29}$; $x_{25} = qb_{30}$; $x_{26} = qb_{31}$

Estimation Procedure

Goodness of Fit Tests

The model was assessed with the logistic classification, the prediction was done using:

$\hat{Y}$= 0 when $\pi_i \geq \pi_0$

$\hat{Y}$= 1 when $\pi_i < \pi_0$ for some cut off π_0

Let Y denote the true state of an individual with categories with values

0 denoting an unhealthy individual

1 denoting a healthy individual

Let $\hat{Y}$ denote the outcome of diagnostic test of an individual with categories with values

Sensitivity = P(Y=1/$\hat{Y}$=1)

Specificity = P(Y=0/$\hat{Y}$=0)

Setting Cut Off Value

The default cut value in IBM SPSS is .50. If the estimated P value for an individual is .50 or greater, we predict membership in the Yes group. Alternatively, the odd ratios could be used either directly or setting the cut value at a lower point to maximize precision of getting the infected person (Fischer *et al*., 2003; Hajian-Tilaki, 2017; Dale, 2017; Soner, 2020).

RESULTS AND DISCUSSION

Results

Indicator variables common to both WHO quality of life instruments that is, WHOQoL-HIV (BREF) and WHOQoL (BREF) were used. Binary logistic regression was applied to the data in this work.

Let Y denote the true state of an individual with categories:

0 denoting an HIV infected individual

1 denoting a non-HIV infected individual

Table 1 shows all the twenty six (26) variables that are common to both infected and non-infected persons, their levels of significance at 0.05 significant level and their odd ratios using logistic regression. Variables qb2, qb5, qb7, qb11, qb14, qb16, qb22 and qb26 which represented Satisfaction with health; Dependence on medication or treatment; Spirituality, Religion and Personal Believe; Thinking, learning, memory & concentration; Energy & Fatigue; Financial resources; Activities of daily living; and Sexual activity respectively were the variables that contributed more to the quality of non-infected individuals compared to infected individuals.

The model for the 26 variables was derived from the discriminant function coefficients as stated below:

$$\begin{aligned} Y = {} & 0.178x_1 - 0.185x_2 + 0.772x_3 \\ & + 0.038x_5 + 0.063x_6 \\ & - 0.229x_7 - 0.094x_{11} \\ & + 0.141x_{12} + 0.166x_{13} \\ & - 0.168x_{14} + 0.018x_{15} \\ & - 0.313x_{16} + 0.050x_{18} \\ & + 0.096x_{19} + 0.230x_{20} \\ & + 0.182x_{21} - 0.222x_{22} \\ & + 0.078x_{23} + 0.156x_{24} \\ & + 0.213x_{25} - 0.118x_{26} \\ & - 0.007x_{27} + 0.208x_{28} \\ & + 0.061x_{29} + 0.084x_{30} \\ & + 0.367x_{31} \end{aligned}$$

The model shows that most of the variables with odd ratios greater than one have corresponding negatively signed coefficients.

For this work, to calculate the sensitivity and the specificity of the model above, a cut-off point of 0.258 was set since the lowest odd ratio for the questionnaire is within this threshold value as shown in Table 1, also to maximize precision about infected persons. Therefore, for an individual, if $Y_0 \geq 0.258$ implies infected and if $Y_0 < 0.258$ implies non-infected. The following are the results:

Sensitivity = 88%

Specificity = 93%

Positive Predictive Value (PPV) = 90%

Negative Predictive Value (NPV) = 92%

Table 1 also showed the following variables were not significant: qb5- Dependence on medication or treatment; qb6- Positive feelings; qb15- Body image & appearance; qb18- Opportunities for acquiring new information & skill; qb19- Participation in recreation/leisure activities; qb23- Work capacity; qb27- Social support. These variables were removed and binary logistic regression was again carried out on the remaining 19 variables in the model. This was followed by the diagnostic accuracy tests.

Table 3 shows only nineteen (19) out of the twenty six (26) variables that are significant at 0.05 significant level and their odd ratios using logistic regression. Variables qb2, qb7, qb11, qb14, qb16, qb22 and qb26 which represented Satisfaction with your health; SRPB: Spirituality, Religion and Personal Believe; Thinking, learning, memory & concentration; Energy & Fatigue; Financial resources; Activities of daily living; and Sexual activity were the variables that contributed more to the quality of life of non-infected individuals compared to infected individuals.

The model for the 19 variables was derived from the discriminant function coefficients as stated below:

$$\begin{aligned} Y = {} & 0.180x_1 - 0.172x_2 + 0.795x_3 \\ & - 0.231x_7 - 0.084x_{11} \\ & + 0.131x_{12} + 0.191x_{13} \\ & - 0.132x_{14} - 0.289x_{16} \\ & + 0.262x_{20} + 0.180x_{21} \\ & - 0.208x_{22} + 0.189x_{24} \\ & + 0.200x_{25} - 0.107x_{26} \\ & + 0.206x_{28} + 0.078x_{29} \\ & + 0.117x_{30} + 0.372x_{31} \end{aligned}$$

The variables listed above with odd ratios greater than one have corresponding negatively signed coefficients, which implies that they are less likely to cause changes in the satisfaction with life of an infected person. To calculate the sensitivity and the specificity of the model above, a cut-off point for nineteen significant variables was set to be 0.255 to maximize precision of infected persons. Therefore, for an individual, if $Y_0 \geq 0.255$ implies infected and if $Y_0 < 0.255$ implies non-infected. The results for the reduced questionnaire are as follows:

Sensitivity = 89%
Specificity = 92%
Positive Predictive Value (PPV) = 88%
Negative Predictive Value (NPV) = 92%

Table 1: All 26 variables showing odd ratio values

Variable	B	S.E.	Wald	Df	Sig.	Exp(B)
qb1	-0.826	0.187	19.417	1	0.000	0.438
qb2	0.659	0.167	15.564	1	0.000	1.932
qb3t	-1.416	0.113	157.033	1	0.000	0.243
qb5t	0.079	0.112	.492	1	0.483	1.082
qb6	-0.148	0.143	1.066	1	0.302	0.863
qb7	0.439	0.127	12.037	1	0.001	1.552
qb11	0.318	0.151	4.457	1	0.035	1.374
qb12	-0.457	0.156	8.584	1	0.003	0.633
qb13	-0.396	0.160	6.127	1	0.013	0.673
qb14	0.572	0.168	11.613	1	0.001	1.771
qb15	-0.122	0.124	0.965	1	0.326	0.885
qb16	0.890	0.127	49.465	1	0.000	2.435
qb18	-0.146	0.138	1.106	1	0.293	0.865
qb19	-0.105	0.127	.688	1	0.407	0.900
qb20	-0.894	0.176	25.892	1	0.000	0.409
qb21	-0.525	0.148	12.635	1	0.000	0.591
qb22	0.684	0.165	17.150	1	0.000	1.981
qb23	-0.288	0.166	2.998	1	0.083	0.750
qb24	-0.329	0.162	4.104	1	0.043	0.720
qb25	-0.526	0.158	11.059	1	0.001	0.591
qb26	0.440	0.132	11.155	1	0.001	1.553
qb27	-0.065	0.142	.210	1	0.647	0.937
qb28	-0.703	0.149	22.429	1	0.000	0.495
qb29	-0.283	0.134	4.459	1	0.035	0.753
qb30	-0.267	0.135	3.889	1	0.049	0.766
qb31t	-0.853	0.103	68.887	1	0.000	0.426

Table 2: Sensitivity and specificity of 26 variables model

		Actual status of respondents	
Actual status from model		*Infected*	*Non-Infected*
	Infected	495	55
	Non-Infected	69	749

Table 3: Odd ratios for the 19 Significant Variables

Variable	B	S.E.	Wald	Df	Sig.	Exp(B)
qb1	-0.776	0.183	18.005	1	0.000	0.460
qb2	0.628	0.165	14.560	1	0.000	1.874
qb3t	-1.378	0.098	198.378	1	0.000	0.252
qb7	0.394	0.122	10.410	1	0.001	1.483
qb11	0.302	0.148	4.179	1	0.041	1.353
qb12	-0.465	0.154	9.121	1	0.003	0.628
qb13	-0.514	0.149	11.885	1	0.001	0.598
qb14	0.438	0.153	8.207	1	0.004	1.550
qb16	0.822	0.121	46.007	1	0.000	2.275
qb20	-1.032	0.164	39.625	1	0.000	0.356
qb21	-0.530	0.143	13.755	1	0.000	0.588
qb22	0.618	0.157	15.493	1	0.000	1.855
qb24	-0.478	0.143	11.135	1	0.001	0.620
qb25	-0.503	0.152	11.000	1	0.001	0.605
qb26	0.411	0.125	10.840	1	0.001	1.508
qb28	-0.603	0.136	19.495	1	0.000	0.547
qb29	-0.351	0.128	7.540	1	0.006	0.704
qb30	-0.352	0.126	7.756	1	0.005	0.703
qb31t	-0.843	0.099	72.831	1	0.000	0.430

Table 4: Sensitivity and specificity of model for 19 variables

		Actual status of respondents	
Actual status from model		*Infected*	*Non-Infected*
	Infected	497	67
	Non-Infected	63	741

Discussion

Positive predictive value (PPV) is the proportion of patients with positive investigation who actually have the disease, that is, PPV presents how many of the infected persons whose investigations are truly positive, and if this number is above or as close to 100 as possible, then it proposes that the performance of this new test is as good as the gold standard. On the other hand, Negative predictive value (NPV) is the proportion of investigated persons with negative tests who do not have the disease, that is, NPV presents how many of the investigated persons that tested negative are truly negative, and if this number is above or close to 100, then it proposes that the performance of this new test is as good as the gold standard. Therefore, the PPV and NPV of the reduced instrument is as good as the results obtained using the WHO quality of life instruments for the dataset used in this work.

CONCLUSION AND POLICY RECOMMENDATIONS

This work revealed that the positive predictive value (PPV) and the negative predictive value (NPV) for the 26 items from both WHOQoL (BREF) and WHOQoL-HIV (BREF) for the dataset used were 90% and 92% respectively. While the PPV and NPV for the instrument with 19 reduced items were 88% and 92% respectively. Therefore, the PPV and NPV of

the reduced instrument is as good as the standard WHO quality of life measurements. Also, the variables (Dependence on medication or treatment; Positive feelings; Body image & appearance; Opportunities for acquiring new information & skill; Participation in recreation/leisure activities; Work capacity; Social support) that were removed from the proposed instrument, were discovered to be insignificant to individuals in developing countries like Nigeria and so could be left out of the WHOQoL questionnaire. When these variables are removed, more time will be saved in filling the questionnaire during routine clinic and people will be willing to produce true state of their health. Consequent upon these, the reduced questionnaire/measurement with 19 variables can be used instead of the questionnaire/measurement with 26 variables, using the Nigerian data as a trial for both HIV infected persons and non-HIV infected persons

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