Original Article

Willingness to Trade Life for Better Vision: A Study of Time Trade-Off among Glaucoma Patients in a Tertiary Health Institution in Nigeria

Nnenne N. Ani[1], Chinyere N. Pedro-Egbe[2], Elizabeth A. Awoyesuku[2], Godswill I. Nathaniel[2]

[1]Department of Ophthalmology, Federal Medical Center Yenagoa, Bayelsa State, Nigeria, [2]Department of Ophthalmology, University of Port Harcourt Teaching Hospital, Port Harcourt, Rivers State, Nigeria

Abstract

Objectives: This study aims to determine the time trade-off (TTO) among glaucoma patients at the University of Port Harcourt Teaching Hospital in Rivers State Nigeria. **Materials and method:** This was a hospital-based study at the University of Port Harcourt Teaching Hospital of the time trade-off utility of glaucoma patients aged 18 years and older with no history of coexisting ocular pathology or chronic illness. Subjects were selected by a simple random sampling method, and a time trade-off utility questionnaire was administered. Ocular examinations done included visual acuity, applanation tonometry, gonioscopy, and slit-lamp examination using a + 78 diopter lens; refraction was also done for each patient. Perimetry was done using standard achromatic perimetry with a fast threshold central 24-2 strategy. Data obtained were analyzed using SPSS (Version 20), and the *P*-value was set at <0.05. **Result:** Two hundred and ninety-nine (299) subjects participated in the study. There were 141 males (47%) and 158 females (53%) giving a male: female ratio of 1:1.12. The age range was 20 to 86 years with a mean age of 53.61± 14.23 years. The mean score of time trade-off among the study population was 0.84 ± 0.1417 (95% CI 0.82–0.86). Worsening BCVA in the better eye ($P = 0.025$) was shown to be the only predictive factor of lower TTO quality of life. **Conclusion:** This study shows that there is a reduced time trade-off quality of life among this cohort of glaucoma patients. Therefore, it is important for ophthalmologists to bear this in mind, noting the important role of counseling in the management of glaucoma patients.

Keywords: Better vision, glaucoma patients, time trade-off

Introduction

Glaucoma is a serious ophthalmic problem and the leading cause of irreversible blindness worldwide.[1,2] In the past years, efforts had been made to assess the extent to which chronic diseases such as glaucoma can affect the quality of life of the individual.[3] Loss of visual function is the main determinant of health-related quality of life for glaucoma patients.[4] Reduced vision affects driving, walking, reading, night vision, judging distances, and seeing objects by the side.[5,6] This would consequently result in injuries from falls and accidents.[7] All these factors affect patients' quality of life and can be reflected in the quality of life assessment.[4]

Time trade-off is an indicator of the quality of life of the patient in relation to his disease.[8] It is a utility value that measures how a patient's disease affects his everyday activities.[8] Utilities are often referred to as patient's preferences because a patient can prefer to trade something of value (time, life, money, etc.) to improve his or her health status or to trade nothing and remain in the same health state.[9] It is assumed that the more life-years people are willing to trade off, the worse their health status and the lower the utility scores; the greater the need for an aggressive treatment.[10,11] Therefore, assessment of time trade-off among glaucoma patients in the clinic will be beneficial

Access this article online

Quick Response Code:

Website: www.nigerianjournalofophthalmology.com

DOI: 10.4103/njo.njo_12_22

Address for correspondence: Godswill I. Nathaniel, Department of Ophthalmology, University of Port Harcourt Teaching Hospital, Port Harcourt, Rivers State, Nigeria.
E-mail: drnathy2013@gmail.com

Received: 27 June 2022 **Revised:** 27 December 2022
Accepted: 14 January 2023 **Published:** 16 August 2023

How to cite this article: Ani NN, Pedro-Egbe CN, Awoyesuku EA, Nathaniel GI. Willingness to Trade Life for Better Vision: A Study of Time Trade-Off among Glaucoma Patients in a Tertiary Health Institution in Nigeria. Niger J Ophthalmol 2023;31:50-4.

and will help in the approach to manage and improve their quality of life. Ophthalmologists often focus on the glaucomatous optic disc, serial visual field testing, and nerve fiber layer analysis as their measure of success or failure of glaucoma therapy, yet these are just one aspect of the overall effect of glaucoma on a patient.[4] Addressing issues related to the quality of life means that both the ophthalmologist and the patient must work together to achieve common, realistic goals that would lead to patient satisfaction.[12] In this regard, addressing issues such as time trade-off among glaucoma patients can lead to glaucoma patients' overall wellbeing.

Materials and Method

This was a hospital-based cross-sectional study of the time trade-off utility of glaucoma (of different types of) patients aged 18 years and older recruited by simple random sampling technique at the Department of Ophthalmology, University of Port Harcourt Teaching, Port Harcourt (UPTH) from February to June 2016. Glaucoma patients with ocular comorbidities such as cataract, age-related macular degeneration (ARMD), diabetic retinopathy, previous incisional ocular surgery or laser surgery in the previous 3 months, systemic preexisting conditions such as diabetes mellitus, hypertension, and immunosuppression were excluded.

Ethical approval was obtained from the Health Ethics and Research Committee of University of Port Harcourt Teaching Hospital. The study was conducted in conformity with the Helsinki Declaration on the use of Human Subjects for Research. Informed written consent was obtained from all the subjects.

Face-to-face time trade-off (TTO) questionnaire was administered by a single ophthalmologist (ANN) after ascertaining that the participants met the eligibility criteria. To reduce any bias that could occur because of translation, the questionnaire was administered in pidgin English, which is the prominent language used in Port Harcourt city especially among the illiterate population.

The values of time-trade off utility analysis were calculated using an example as shown below[8]:

How to calculate a utility score: an example[8]
Age of the respondent 50 years
Age the subject expects to live 70 years
Response to the time-trade off question above 10 years
Step 1: Determine the number of additional years the patient expects to live 70–50 = 20 additional years
Step 2: Divide the number of years the respondent is willing to give up spending the rest of his/her living years free of glaucoma from the value obtained in step 1 10/20 = 0.50
Step 3: Subtract the value obtained in step 2 from 1.0 1.0–0.50 = 0.50

Interpretation: The respondent is willing to give up 50% of his/her remaining life years in a trade-off for life without glaucoma. The utility value was calculated by subtracting the percentage of remaining years traded (0.50, i.e., 50%) from the state of perfect health 1.0 (100%).[8]

All the patients had a comprehensive anterior segment examination, gonioscopy, and slit lamp ophthalmoscopy with +78D Volk lens. The anterior chamber angle was graded using Schafer grading system. They also had achromatic standard automated perimetry 24-2 full threshold strategy using Hensen visual field analyzer.

Data analysis

Data obtained from all participants were cross-checked for correctness and completeness. Comprehensive data analysis was done with the help of a statistician using the Statistical Package for Social Sciences version 20 (SPSS 20). The distribution of the clinical parameters of the subjects was presented as frequency charts and tables as appropriate.

Quantitative variables (TTO) were summarized using means and standard deviations. The one-way analysis of variance (ANOVA/F-test) was used to determine statistically significant differences between the means of three or more groups while student's *t* test was used for differences between two groups. Chi-square and Fishers exact tests were used as appropriate to determine statistically significant differences in proportions. A P value <0.05 was considered statistically significant. Variables that were statistically significant were entered into a multivariate analysis model. Multivariate analysis, in the form of logistic regression and multiple linear regression was employed as appropriate to identify risk factors and control for possible confounders. Odds ratios were computed to measure the strength of association between variables and confidence intervals were calculated at 95% level.

Results

Two hundred and ninety-nine (299) glaucoma patients participated in this study. There were 141 males (47%) and 158 females (53%) giving a male: female ratio of 1:1.12. The age range was 20 to 86 years with a mean age of 53.61± 14.23 years. [Table 1].

The mean score of TTO among the study population was 0.84 ±0.1417 (95% CI 0.82–0.86). Subjects aged less than 21, 51–60, and 81–90 years had significantly lower TTO score; ($P=0.001$) while those aged 31–40 years showed significantly higher TTO quality of life. Males showed lower TTO utility score compared to females ($P=0.017$) and subjects with tertiary level of education had higher TTO utility value compared to those with lower educational level ($P=0.013$). The mean TTO score compared with the occupational status was not statistically significant. Those who were married and those who were single had almost the same mean TTO score *t*. [Table 2].

Subjects who had glaucoma for 11 to 15 years and 21 to 25 years had lower TTO utility score compared to others; however, this was not statistically significant. Subjects

Table 1: Age and gender distribution of the study population

Age groups (years)	Gender		
	Male number (%)	Female number (%)	Total number (%)
<21	3(27.3)	8(72.7)	11(100.0)
21–30	0(0.00)	6(100.0)	6(100.0)
31–40	11(35.5)	20(64.5)	31(100.0)
41–50	32(42.1)	44(57.9)	76(100.0)
51–60	41(54.7)	34(45.3)	75(100.0)
61–70	39(52.0)	36(48.0)	75(100.0)
71–80	8(44.4)	10(55.6)	18(100.0)
81–90	7(100.0)	0(0.00)	7(100.0)
Total	**141 (47.2%)**	**158 (52.8%)**	**299 (100.0%)**

Fisher's exact test = 20.107; $P = 0.004$.

Table 2: TTO utility value among study subjects according to socio-demographic parameters

Variables	TTO (Mean ± SD)
Age group (years)	
<21	0.78 ± 0.226
21–30	0.92 ± 0.060
31–40	0.93 ± 0.029
41–50	0.87 ± 0.125
51–60	0.79 ± 0.185
61–70	0.85 ± 0.102
71–80	0.81 ± 0.112
81–90	0.76 ± 0.128
F*-test 4.943; *P* value 0.001	
Gender	
Male	0.82±0.137
Female	0.86±0.144
t*-test 2.394; *P*-value 0.017	
Level of education	
Primary	0.82±0.146
Secondary	0.81±0.172
Tertiary	0.86±0.128
F*-test 4.378; *P* value 0.003	
Occupation	
Retired	0.83±0.132
Student	0.83±0.193
Unemployed	0.87±0.180
Employed	0.85±0.134
***F*-test 0.543; *P* value 0.654**	
Marital status	
Married	0.84±0.140
Single	0.85±0.161
***t*-test 0.528; *P*-value 0.598**	

SD, standard deviation. *Significant *P* value.

who were members of Glaucoma Society had significantly lower quality of life than their non-society counterparts. Those who depend on others (non-self) for financial support for glaucoma treatment were shown to have almost the same utility value. Other mean proportions were not statistically significant. [Table 3].

Subjects with best corrected visual acuity (BCVA) of 6/60–3/60 in the better and worse eye had the same lower mean TTO score. These were statistically significant. The mean TTO scores across the mean deviation of visual field loss in the better and worse eye were not statistically significant. [Table 4].

TTO had a statistically significant correlation with age, duration of glaucoma, and BCVA in the better eye as shown in Table 5.

Following linear regression analysis, BCVA in the better eye showed to be a significant predictor of poor quality of life. As the BCVA in the better eye worsens, the TTO scores reduces by 0.032 ($B = -0.032$; P-value = 0.025) as shown in Table 6.

Discussion

The mean TTO among study subjects was 0.84 ± 0.1417 which indicates a decrease in quality of life (QoL) of 16%. This is similar to a study in South India which reported a mean TTO of 0.81 meaning a decrease in QoL of 19%.[13] Also, the mean TTO in this study is similar to the findings in Singapore and Brazil which reported mean values of 0.82 and 0.88, respectively.[14,15] The value from this study is lower than that in the United States which reported a TTO of 0.91 but higher than that in India with a TTO of 0.64.[16,17] The difference between this study and that from the United States may be attributed to the fact that most of the patients in the United States study had early glaucoma or were glaucoma suspects. Another reason for this difference may be the varying impact of this disease on patients in developing countries with poorer socioeconomic status, economic burden of lifelong therapy, and lack of social support compared to developed countries. These differences underscore the need to regionalize data on utility values.

All the study participants in this study were willing to trade-off life for glaucoma disease. In the study in China, only 35.7% were willing to trade-off life, while in Brazil, 59.5% were willing to trade-off life.[18,15] The reasons all study subjects in China and Brazil were not willing to trade–off life may be because these places have more healthcare and support system, thus, making them less willing to trade off more years as facilities to make life more comfortable are readily in place.

Patients who were less than 20, 50 to 60, and 80 to 90 years were ready to trade off more years (0.78, 0.79, and 0.76,

respectively) and this was statistically significant, ($P = 0.001$). The reason for this finding was not immediately clear and will need further research. On the other hand, Gupta *et al.* reported that older patients were more willing to trade off a greater proportion of their remaining years than younger subjects ($P = 0.46$); however, he used a different age category from the one in this study.[8]

Table 3: TTO utility scores according to clinical parameters

Variables	TTO (mean ± SD)
Duration of glaucoma	
≤5	0.86±0.141
6–10	0.83±0.129
11–15	0.76±0.104
16–20	0.83±0.241
21–25	0.74±0.000
26–30	0.80±0.000
***F* test = 1.712; *P* value = 0.132**	
Type of glaucoma	
POAG	0.84±0.143
PACG	0.88±0.001
SG	0.89±0.001
***F* test 0.292; *P* value = 0.747**	
Family history	
Yes	0.87±0.104
No	0.83±0.156
***t*-test = 1.874; *P* value = 0.062**	
Source of financial support	
Self	0.84±0.138
None-self	0.85±0.148
***t* test = 0.192; *P* value =0.848**	
Glaucoma society	
Yes	0.78±0.190
No	0.85±0.129
t*-test = 3.355; *P* value 0.001	

PACG, primary angle closure glaucoma; POAG, primary open angle glaucoma; SD, standard deviation; SG, secondary glaucoma. *Significant *P* value.

Male patients significantly traded-off more years than female patients in this study. This may be attributed to their sense of responsibility, being breadwinners of the family. This is similar to the study in Brazil, although not statistically significant; $P = 0.207$.[14] A study in India, however, found that female patients were willing to trade off more years (0.48) than male patients (0.69), and the reason advanced in their case was poor understanding of the disease among women and also the fact that they have greater dependency on other family members for decision-making.[8]

Study subjects with lower educational level were ready to trade-off more years than those with tertiary education, and this is similar to the finding by Guedes *et al.* and Gupta *et al*.[14,8] The study by Gupta *et al.* observed that those without formal education or primary education were ready to trade-off significantly more years (0.46) than those with postgraduate education (0.75; $P = 0.038$).[8] This may be explained by a better understanding of the disease and better compliance with treatment by an educated person when compared to those who are less educated.

Those patients with primary open angle glaucoma (POAG) traded-off more years than those with primary angle closure glaucoma (PACG) or secondary glaucoma (SG) in this study; this was, however, not statistically significant and was similar to the report by Gupta *et al*.[8] The reason is probably that the patient is primarily more concerned about his/her visual handicap than the type of glaucoma.

In this study, subjects who have had glaucoma for 21 to 25 years were ready to trade-off more years than those with lower duration. This may be connected to the side effects of treatment and financial burden of frequent hospital visits. Gupta *et al*, on the other hand, reported that those with glaucoma of less than 5 years traded-off more years and

Table 4: TTO utility score according to BCVA and MD of visual field loss in the better and worse eye

Variables	Better eyeTTO (Mean ± SD)	Worse eyeTTO (Mean ± SD)
BCVA		
Group 1 (6/4–6/9)	0.85 ± 0.141	0.84 ± 0.149
Group 2 (6/12–6/18)	0.80 ± 0.150	0.91 ± 0.066
Group 3 (6/24–6/36)	0.83 ± 0.111	0.85 ± 0.115
Group 4 (6/60–3/60)	0.62 ± 0.000	0.62 ± 0.001
Group 5 (< 3/60)	—	0.79 ± 0.174
***F*-test**	**3.622**	**3.593**
***P* value**	**0.014***	**0.007***
Mean deviation		
Mild (≤ −6 dB)	0.85 ± 0.146	0.85 ± 0.140
Moderate (>−6.01 to ≤−12dB)	0.83 ± 0.146	0.82 ± 0.159
Advanced (>−12.01 to ≤−20dB)	0.83 ± 0.133	0.85 ± 0.130
Severe (>−20dB)	———	0.84 ± 0.161
***F*-test**	**0.590**	**0.433**
***P* value**	**0.556**	**0.729**

SD, standard deviation. *Significant *P* value.

Table 5: Relationship between TTO utility score and clinical parameters

Variable	Pearson correlation (*r*)	*P*-value
Age	–0.128	0.027*
Duration of glaucoma	–0.115	0.046*
BCVA in the better eye	–0.148	0.011*
BCVA in the worst eye	–0.036	0.537
MD in the better eye	–0.056	0.338
MD in the worst eye	–0.030	0.604

*Significant *P* value.

Table 6: Multiple linear regression for TTO

Variables	Linear regression		*T*	*P*-value
	B	Std error		
BCVA (better eye)	–0.032	0.014	–2.259	0.025*
Constant	0.935	0.033	28.041	0.001

B, coefficient. *Significant *P* value.

attributed this to the increased ability of the patient to cope with the disease and better understanding of the disease over time.[8]

Time trade-off score significantly decreased as the best corrected visual acuity (BCVA) in the better eye worsens, similar to the findings of Gupta *et al.* and Guedes *et al*.[8,14] Guedes *et al.*, however, used a different method of BCVA classification in their study.[14]

Mean deviation was not found to affect the TTO score in the better or worse eye in this study and corroborates the finding by Gupta *et al*.[8] This may be due to the fact that it is mainly the visual acuity that is more apparent, and therefore, of more concern to the patient and not the status of his visual field.

Age and duration of glaucoma were not predictors of low TTO score in this study, and it corroborates result from Gupta *et al.* and may be probably due to the ability of the patient to cope with their disease over time.[8] MD in the better or worse eye was also not predictive of lower TTO utility score, again corroborating the result of Gupta *et al*.[8] This may be explained by the fact that glaucoma patients can still have some visual activity even in the presence of visual field loss. This report contrasts that of Gothwal *et al.* which reported that worsening mean deviation of visual field defect in the worse eye was a risk factor.[13] On the other hand, worsening BCVA in the better eye was a predictor of low TTO score in this study and is attributed to the fact that the risk of blindness in the better eye can affect the overall sense of well-being of the patient. This report contrasts the report of Gupta *et al*.[8]

Conclusion

Glaucoma patients involved in this study had a decrease in quality of life (QoL) of 16%. Age, female gender, lower educational status, being a previous member of a Glaucoma Society, BCVA in the better and worse eye were associated with lower TTO quality of life. Worsening BCVA in the better eye was the only predictive factor of lower TTO.

Financial support and sponsorship

Nil.

Conflicts of interest

The authors report no conflicts of interest.

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