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ORIGINAL RESEARCH ARTICLE

Evaluation of Health Status of Type 2 Diabetes Outpatients Receiving Care in a Tertiary Hospital in Nigeria

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Abstract

Objectives The aim of this study was to determine the health status of type 2 diabetes patients in a Nigerian tertiary hospital, and examine the sociodemographic and clinical variables that predicted the health status of type 2 diabetes patients in terms of utility valuations and EuroQol Visual Analogue Scale (EQ-VAS) score.

Methods This was a cross-sectional study of 147 diabetes patients attending the University of Nigeria Teaching Hospital, Enugu State, Nigeria. The EQ-5D-5L instrument, version 2.1, was used to evaluate patients' self-reported health status, and patients who gave informed consent completed the questionnaire while waiting to see a doctor. Descriptive and multiple linear regression analyses were performed using SPSS version 20.

Results Overall, 147 patients participated in this study, with a mean age (± standard deviation) of 56.7 years (± 10.33). Over half of the respondents were females (55.1%) and more than half were older than 60 years of age. The mean EQ-VAS and utility valuations of respondents were 72.59 ± 10.51 and 0.72 ± 0.13, respectively. The age of respondents independently and significantly predicted EQ-VAS by −2.659 per year, while the age of respondents, level of education, duration of diabetes, and presence of other illnesses independently and significantly predicted utility valuations by −0.020 per year, +0.029 per level of education, −0.008 per year, and −0.044 per illness, respectively. Less than 39% of patients experienced no problems for each of the dimensions, except self-care (68%).

Conclusion The results of this study revealed a relatively low health status among type 2 diabetic patients in Nigeria. Old age, duration of diabetes and the presence of other illnesses were major contributors to the negative impact on health status, while a higher level of education contributed positively to health status. Adequate family support, as well as regular and effective patient counseling and education, may be worthwhile.

Key Points for Decision Makers

For each dimension, except self-care, over 60% of patients had problems (ranging from 'slight' to 'unable/extreme'.

Old age contributed significantly to low health status in both utility valuations and EuroQol Visual Analogue Scale (EQ-VAS) scores. Family support programmes may be advocated for caregivers and family members in the area of diabetes management.

Diabetes patients with a high level of education showed significant improvement in their health status, which may be due to good diabetes self-care practices. There may be a need for coordinated diabetes education for less-educated patients in order to bridge the knowledge gap of these patients.

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1 Introduction

Diabetes mellitus remains a disease of global importance, especially in developing countries of Africa. It is a chronic metabolic disorder commonly associated with hyperglycaemia, and which may give rise to the development of both short- and long-term complications if not well managed. Some of the life-threatening problems associated with diabetes include diabetic ketoacidosis, hyperglycaemic hyperosmolar state, and macrovascular and microvascular complications, thus making the disease one of the major causes of morbidity and mortality worldwide [1–3]. As a chronic debilitating disease, studies have reported a negative impact of diabetes on the quality of life (QoL) of patients with this condition [4–6].

The management of diabetes often involves a complex treatment regimen and close monitoring, thus increasing the financial burden on patients, the healthcare system, and society at large [7]. Complications occurring due to late diagnosis and late presentation, poor access to essential antidiabetic drugs and services, and poor management of diabetes have created a heavy socioeconomic burden for Nigeria [8] and other African countries [9]. The burden of diabetes can be measured by determining the direct and indirect medical costs [10], with the former consisting of the cost of drugs and laboratory investigations, and the later comprising the costs associated with loss of productivity, premature death and negative effect of the disease on the national economy [11, 12]. In 2010, global health expenditure in the management of diabetes and its complications was estimated to be US$376 billion, and is expected to increase to US$490 billion in 2030 [13]. The direct costs of diabetes may consume 2.5–15.0% of the annual healthcare budgets of any country, depending on the treatment available and local prevalence [14].

1.1 Applications of Multi-Attribute Utility Instruments in Pharmacoeconomic Evaluation

From the perspective of health economics, health-related QoL (HRQoL) is an important patient-reported outcome useful for the purpose of understanding the burden of chronic diseases such as diabetes [15]. HRQoL measures are useful in evaluating the efficacy, cost effectiveness, and net benefits of current healthcare programs and interventions [16], and have been found to be relevant in the economic evaluation of the cost effectiveness of buprenorphine patch in the management of moderate pain [17], early versus late total hip replacement [18], and in the comparison of intensive against conventional education and supervision for the self-management of asthmatic [19] and diabetic patients [20]. At present, several multi-attribute utility instruments (MAUIs) have been developed and used for the purpose of determining HRQoL in principle. Examples of such instruments include the EQ-5D, Short Form-6 dimension (SF-6D), and Health Utility Index (HUI) [21]. MAUIs are standardized, multi-dimensional health-state classifications consisting of pre-established preference or utility weights [22], which aid in the generation of a single index score representing the state of health of an individual. Health-state utility values (HSUVs) are used for assessing the value of an individual's health status relative to perfect health and death on a scale of 0.00–1.00, where 1.00 represents perfect health and 0.00 depicts death [23]. Quality-adjusted life-years (QALYs) can therefore be computed as the product of time spent in a health state and the utility score. QALYs are the unit of benefit used in economic evaluations, such as cost-utility analyses [24]. Notably, MAUIs differ from nonpreference-based instruments as they use pre-established weights in determining the HSUVs of an individual based on their responses to the items contained in the instrument. Unlike MAUIs, generic and disease-specific non-utility instruments cannot be computed into a single number having a standalone meaning. Additionally, unlike nonpreference-based instruments, MAUIs mainly focus on physical and mental health [24, 25].

1.2 EQ-5D Instrument

The EQ-5D is a generic index instrument that has been used in a wide range of disease conditions. It is a simple, self-administered questionnaire consisting of two parts, namely the EQ-5D descriptive system and the EuroQol Visual Analogue Scale (EQ-VAS). The EQ-5D descriptive system measures the five health domains of mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. For the 5-level version (EQ-5D-5L), each of the health domains has five response levels, i.e. no problems, slight problem, moderate problems, severe problem, and unable/extreme. If a scoring algorithm or reference value set is available, the 3125 resulting health states can be converted into a single utility value—the utility valuation [26].

As a measure of health status, the EQ-5D instrument is simple, easy to understand, and requires a shorter time to complete. It has been used widely in research among diabetes and is particularly preferred because of its simplicity and reliability [27]. In addition, the assessment of health status using MAUIs such as the EQ-5D allows burden of disease comparisons across a broad spectrum of diseases and indications. Above all, the instrument aids transformation of utility scores into QALYs for use in economic evaluations of treatment interventions. Because of these advantages, research organizations such as the National Institute for Health and Care Excellence (NICE) have

recommended the EQ-5D for the aforementioned purpose [28, 29]; however, NICE recognize that the EQ-5D may not be an appropriate instrument for assessing health-related utility in all circumstances. Hence, the choice of MAUI for economic evaluations should be determined by the innate sensitivities of the instrument to the relevant domains of health for the study population [25].

A search of the literature showed that the EQ-5D instrument has been rarely used in assessing health status among the diabetic population in Nigeria. Therefore, the aim of this study was to evaluate the health status of diabetes patients at the University of Nigeria Teaching Hospital (UNTH), Ituku-Ozalla, Enugu State, using the EQ-5D-5L instrument, and to also explore the determinants of health status (utility valuations and EQ-VAS scores) of patients.

2 Methods

2.1 Study Design and Participants

This cross-sectional study was conducted among diabetic outpatients at the UNTH, Ituku-Ozalla, Enugu State (one of the tertiary hospitals in the state, with a bed capacity of over 500). Because of the expertise of the healthcare professionals at the hospital, patients from across most south-eastern states of Nigeria visit the facility for medical attention.

Overall, 147 patients were included in this study. The clinic appointment was usually scheduled for a 1-month interval, except in critical situations, and it was assumed that all potential patients were covered within the 3 months of the study period, thus there was no sample size determination. Patients diagnosed with diabetes by an endocrinologist at the Diabetes Outpatient Clinic, and who were receiving antidiabetic drugs at that time, were recruited into the study. All patients who consented and visited the clinic within the study period were included; however, two pregnant women, five critically ill patients (those who could not fill out the questionnaires due to impairments resulting from their illnesses, as certified by the endocrinologist) and seven patients who declined to participate due to a lack of interest were excluded from the study.

2.2 Study Instrument

The health status of respondents was determined using the EQ-5D-5L instrument, English language, version 2.1. Because the EQ-5D has seldom been used in Nigeria, there was no reference value set, thus we adopted the health state values of Zimbabwe [30] since both countries are in the Afro-D region of sub-Saharan Africa. The EQ-VAS is a vertical visual analog scale 20 cm in length, with a scale ranging from 0 (worst imaginable health state) to 100 (best imaginable health state). Both the EQ-5D and EQ-VAS evaluate the health status of respondents on the day of the survey. Additionally, a section of the questionnaire contained the sociodemographic (age, sex, marital status, occupational status, level of education attained, smoking status, and drinking status) and clinical characteristics (duration of illness and comorbidities) of respondents.

2.3 Data Collection

The researchers distributed the survey instrument to patients at the Diabetes Outpatient Clinic of the hospital as they were waiting to see a physician. Where necessary, the questions were clarified by the researchers as patients were filling out the questionnaires, and the questionnaires were collected immediately after completion. The study was conducted between May and July 2016 during the hospital's routine diabetes clinic days. Information pertaining to patients' clinical characteristics was derived from the clinical case notes.

2.4 Statistical Analysis

The sociodemographic and clinical variables of respondents were presented as frequencies and percentages, the health profiles were presented in frequencies stratified by age group, and the EQ-VAS score and utility valuations were presented as mean ± standard deviation (SD). A multiple regression analysis was carried out to determine the independent predictors of the EQ-VAS and the utility valuations. The dependent variables were EQ-VAS score and utility valuations, whereas the independent variables included age, sex, marital status, level of education, occupation, alcohol use, smoking, number of diabetic complications and number of comorbidities. All statistical tests were considered significant at $p \leq 0.05$. Data analysis was performed using SPSS version 20 (IBM Corporation, Armonk, NY, USA).

2.5 Ethical Considerations

The study protocol was approved by the Health Research Ethics Committee of the UNTH, Ituku-Ozalla, Enugu State. Oral consent was obtained from all patients who participated, and the data collected were treated with the utmost confidentiality both during and after the study.

3 Results

Overall, 147 patients participated in this study, with a mean age (±SD) of 56.7 years (±10.33). Over half of the respondents were females (55.1%), and more than half

were older than 60 years of age (59.9%). Only one-quarter (25.9%) had a tertiary education. Those who drank alcoholic beverages were fewer than those who did not, although the majority also had other illnesses. The average EQ-VAS score and utility valuation of respondents were 72.59 ± 10.51 and 0.72 ± 0.13, respectively (see Table 1 for further details).

In the multiple regression analysis, only age of respondents (β coefficient = −2.659) independently predicted the EQ-VAS score, while age of respondents (β coefficient = −0.020), level of education (β coefficient = +0.029), duration of diabetes (β coefficient = −0.001) and the presence of other illnesses (β coefficient = −0.044) predicted the utility valuation independently. Details of sociodemographic and clinical variable associations with EQ-VAS and utility valuations are shown in Table 2.

Table 3 shows that <39% of patients had no problems (level 1 only) in all dimensions [mobility (38.8%), usual activities (37.4%), pain/discomfort (17.0%) and anxiety/depression (28.6%)], except self-care (68%). However, overall analysis showed that many of the respondents had slight and moderate problems (levels 2 and 3) in all dimensions, while very few (none for 'anxiety/depression') had 'severe' and 'unable/extreme' problems (levels 4 and 5) in each of the dimensions.

Table 1 Demographic and clinical characteristics of respondents

Variables	Frequency (%)
Age, years	
30–39	2 (1.4)
40–49	21 (14.3)
50–59	36 (24.5)
60–69	52 (35.4)
> 69	36 (24.5)
Sex	
Male	66 (44.9)
Female	81 (55.1)
Marital status	
Currently married	102 (69.4)
Widowed	41 (27.9)
Separated	1 (0.7)
Single	3 (2.0)
Level of education	
No formal education	13 (8.8)
Primary	49 (33.3)
Secondary	47 (32.0)
Tertiary	38 (25.9)
Occupation	
Self-employed	34 (23.1)
Employee	31 (21.1)
Retired	82 (55.8)
Drink alcohol	
No	124 (84.4)
Yes	23 (15.6)
Smoking	
No	144 (98.0)
Yes	3 (2.0)
Other illnesses	
No	66 (44.9)
Yes	81 (55.1)
Average duration of diabetes, years[a]	11.14 ± 7.07
Average age[a]	56.7 ± 10.33
Average EQ-VAS score[a]	72.59 ± 10.51
Average utility valuation[a]	0.72 ± 0.13

EQ-VAS EuroQol Visual Analogue Scale

[a] Mean ± standard deviation

4 Discussion

This study was aimed at using EQ-5D-5L to evaluate the health status of diabetic patients in a tertiary healthcare facility, as well as determining the predictors of EQ-VAS score and utility valuations. Our findings showed that respondents in this study had a relatively low health status when compared with the Zimbabwean population norms on which our patients' health state valuation was based [30]. Additionally, our study revealed that age, level of education, duration of diabetes and presence of other illnesses were predictors of respondents' health status.

Previous studies on the health status of diabetes patients have reported similar EQ-VAS scores and utility valuations. For instance, our results were consistent with those found in Norway [31], Bangladesh [32] and Nigeria [33], but lower than findings in Korea [34] and Japan [35]; however, the average EQ-VAS scores and utility valuations were higher than those reported in Iran [36].

When our results were compared with the Zimbabwean population norms on which our value set was based, it was revealed that the proportion of 'no problem' statuses reported in all five dimensions was far lower than those reported in Zimbabwe in all age categories. The same trend was recorded in utility valuations and EQ-VAS scores, which were 0.842 and 79.8, respectively, in Zimbabwe [30, 37]. Hence, our results indicate that diabetes patients in our study valued their health lower than the Zimbabwean general population. Perhaps the observed variations were expected as the Zimbabwean study used the general population, who were not necessarily sick, while this study used diabetes patients [37]. Differences in socioeconomic and healthcare systems across the regions could be major

Table 2 Multiple regression analysis of EQ-VAS score and EQ-5D with demographic and clinical variables

	β Coefficient	SE	t	R	R^2	Adjusted R^2	p value
EQ-VAS[a]				0.263	0.069	0.063	
(Constant)	85.010	3.870	21.969				<0.001[c]
Age of respondents	−2.659	0.808	−3.289				0.001[c]
Sex	1.166	1.807	0.645				0.520
Marital status	−1.740	1.456	−1.195				0.234
Level of education	1.013	0.926	1.094				0.276
Occupation	0.186	1.210	0.154				0.878
Alcohol intake	−3.469	2.482	−1.398				0.164
Cigarette smoking	−6.416	6.210	−1.033				0.303
Other illnesses[b]	−2.076	1.749	−1.187				0.237
Diabetes duration	−0.131	0.134	−0.998				0.320
Utility valuation[a]				0.605	0.366	0.348	
(Constant)	0.847	0.055	15.325				<0.001[c]
Age of respondents	−0.020	0.010	−2.087				0.039[c]
Sex	0.024	0.021	1.135				0.258
Marital status	−0.008	0.017	−0.483				0.630
Level of education	0.029	0.010	3.010				0.003[c]
Occupation	−0.015	0.014	−1.040				0.300
Alcohol intake	0.018	0.029	0.645				0.520
Cigarette smoking	−0.027	0.072	−0.382				0.703
Other illnesses[b]	−0.044	0.018	−2.411				0.017[c]
Diabetes duration	−0.008	0.001	−5.655				<0.001[c]

EQ-VAS EuroQol Visual Analogue Scale, *SE* standard error

[a] Dependent variables

[b] Other illnesses (hypertension, kidney diseases, heart diseases, hyperlipidaemia, stroke, congestive heart failure, arthritis and respiratory disorders)

[c] Significant at $p \leq 0.05$

t t statistic (the coefficient divided by its standard error), R Multiple correlation coefficient, *SE* Standard Error

contributors. In developing and resource-limited countries such as Nigeria, some individuals with diabetes remain undiagnosed until complications set in. Thus, such delays in seeking medical attention, largely due to limited income and ignorance, may negatively impact on the health status of such individuals.

The age of respondents was found to independently predict the EQ-VAS scores and utility valuations. In other words, our results indicate that the higher the age of patients, the lower their health status scores. Our findings were consistent with those of other studies [33, 36, 38, 39]; however, surprisingly, a study in Canada reported a better health status among diabetes patients with increasing age [40]. Nonetheless, besides the burden and restrictions associated with diabetes management, it is only natural for limitations in physical and mental functioning to increase as an individual advances in age [41, 42]. Thus, this may explain the inverse relationship observed between age and health status scores as the majority of respondents in this study were aged 60 years and older.

In the present study, level of education had a significant positive linear relationship on the health status of patients, i.e. as the educational level of respondents increases, so does their health status. Hence, individuals who attained a tertiary education had a better health status than those who had a secondary or primary education or no formal education, in that order. This finding was expected as patients who had a higher education are likely to have a better understanding of their disease state, the need for medication adherence, self-care, and lifestyle modifications, as is required in the management of a devastating chronic disease such as diabetes. Additionally, such individuals are better placed financially in society, and can therefore readily afford the best treatment available. Moreover, similar results are well-documented in literature [33, 36, 43, 44].

Furthermore, the present study also identified a significant negative association between the presence of other illnesses or comorbidities and utility valuations among diabetic patients. This finding concurs with the findings of

Table 3 Health profile of the study population stratified by age group

EQ-5D dimension	Age group, years [frequency (%)]					
	30–39	40–49	50–59	60–69	>69	Total
Mobility						
No problems	2 (1.4)	13 (8.8)	20 (13.6)	7 (11.6)	5 (3.4)	57 (38.8)
Slight problems	0 (0.0)	6 (4.1)	1 (0.7)	19 (12.9)	9 (6.1)	44 (29.9)
Moderate problems	0 (0.0)	2 (1.4)	6 (4.1)	14 (9.4)	17 (11.6)	39 (26.5)
Severe problems	0 (0.0)	0 (0.0)	0 (0.0)	2 (1.4)	2 (1.4)	4 (2.7)
Unable to walk about	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (2.0)	3 (2.0)
Self-care						
No problems	2 (1.4)	19 (12.9)	27 (18.4)	38 (25.9)	14 (9.4)	100 (68.0)
Slight problems	0 (0.0)	1 (0.7)	6 (4.1)	11 (7.5)	13 (8.8)	30 (20.4)
Moderate problems	0 (0.0)	1 (0.7)	1 (0.7)	1 (0.7)	5 (3.4)	8 (5.4)
Severe problems	0 (0.0)	0 (0.0)	2 (1.4)	0 (0.0)	1 (0.7)	3 (2.0)
Unable to wash or dress	0 (0.0)	0 (0.0)	0 (0.0)	2 (1.4)	4 (2.7)	6 (4.1)
Usual activities						
No problems	2 (1.4)	12 (8.2)	15 (10.2)	21 (14.3)	5 (3.4)	55 (37.4)
Slight problems	0 (0.0)	4 (2.7)	12 (8.2)	21 (14.3)	11 (7.5)	48 (32.7)
Moderate problems	0 (0.0)	4 (2.7)	8 (5.4)	6 (4.1)	10 (6.8)	28 (19.0)
Severe problems	0 (0.0)	1 (0.7)	0 (0.0)	2 (1.4)	7 (4.8)	10 (6.8)
Unable to do usual activities	0 (0.0)	0 (0.0)	1 (0.7)	2 (1.4)	3 (2.0)	6 (4.1)
Pain/discomfort						
No pain or discomfort	2 (1.4)	5 (3.4)	7 (4.8)	9 (6.1)	2 (1.4)	25 (17.0)
Slight pain or discomfort	0 (0.0)	11 (7.5)	18 (12.2)	17 (11.6)	10 (6.8)	56 (38.1)
Moderate pain or discomfort	0 (0.0)	5 (3.4)	11 (7.5)	25 (17.0)	21 (5.4)	62 (42.2)
Severe pain or discomfort	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.7)	3 (2.0)	4 (2.7)
Extreme pain or discomfort	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Anxiety/depression						
Not anxious or depressed	2 (1.4)	7 (4.8)	11 (7.5)	14 (9.4)	8 (5.4)	42 (28.6)
Slightly anxious or depressed	0 (0.0)	11 (7.5)	22 (15.0)	33 (22.4)	23 (15.6)	89 (60.5)
Moderately anxious/depressed	0 (0.0)	3 (2.0)	3 (2.0)	5 (3.4)	5 (3.4)	16 (10.9)
Severely anxious/depressed	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Extremely anxious/depressed	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Utility Valuations[a]	0.90 ± 0.01	0.79 ± 0.09	0.76 ± 0.10	0.73 ± 0.12	0.63 ± 0.15	0.72 ± 0.13
EQ-VAS[a]	87.50 ± 3.50	75.48 ± 10.60	74.72 ± 9.18	71.92 ± 10.00	68.89 ± 11.35	72.59 ± 10.51

EQ-VAS EuroQol Visual Analogue Scale

[a] Mean ± standard deviation

other researchers, who also observed that health status decreases significantly in the presence of comorbidities [31, 33, 36].

More than half of the patients in this study had comorbidities. This is consistent with a study performed in Canada [45] which concluded that the illness burden experienced by individuals with diabetes was not only associated with diabetes itself but also largely with comorbid medical conditions. Lloyd et al. [46] concluded that the presence of even mild diabetes complications had a significant impact on the QoL of patients. Early diagnosis and treatment is essential to help prevent the deterioration of HRQoL in these patients. Other similar studies [47–49] revealed that stroke and other comorbidities can impose considerable health deficits on patients. Furthermore, Westaway [48] reported that chronic disease status and comorbidities were more important determinants of health and well-being than ethnicity, age, language, sex, and marital status. QoL is also increasingly recognized as an important health outcome in its own right, representing the ultimate goal of all health interventions [50]. This emphasized the considerable public health impact all of

these chronic conditions have on HRQoL, particularly when they occur together. It is probable that having to deal with other health conditions may likely present a unique and daunting challenge to individuals with diabetes. More than half of respondents in our study were aged 60 years and older, and most have retired from active service.

Less than 39% of patients had no problems in all dimensions (mobility, usual activities, pain/discomfort and anxiety/depression), except self-care (68%). The greater proportion of patients had some level of problems, which might be due to the complications of diabetes, old age, the long duration of diabetes, and comorbidities. Indeed, the presence and severity of complications or comorbidities have been associated with depression, anxiety and impairment on multiple dimensions of HRQoL in diabetes [51].

However, overall analysis showed that many of the respondents had slight and moderate problems (levels 2 and 3) in all dimensions, while very few (none for 'anxiety/depression') had 'severe' and 'unable/extreme' problems (levels 4 and 5) in each of the dimensions. More limitations or problems (levels 2–5) were reported in 'pain/discomfort' and 'anxiety/depression', which is in line with findings reported in Japan [35] and Iran [36], where patients reported major limitations in 'pain/discomfort' and 'anxiety/depression'. Furthermore, a study in Bangladesh identified 'pain/discomfort' as the only most frequently reported complaint among type 2 diabetic patients [32].

This study revealed that the long duration of diabetes also had a considerable health deficit on diabetes patients. This result is consistent with a report from the American Diabetes Association [52] which stated that the longer the duration of diabetes, the higher chances of a patient developing overt nephropathy, retinopathy and stroke, which in turn lowered the HRQoL of patients. To improve the HRQoL in patients with type 2 diabetes, early diagnosis of the disease and aggressive management of risk factors are necessary to prevent or delay the development of diabetes complications. Resource utilization in terms of overnight hospitalization, contact with a doctor in the emergency room, and increased numbers of doctors' visit are higher in patients with a longer duration of illness. This can impose enormous economic burden on patients in the management of diabetes and costs associated with the loss of productivity, premature death and the negative effect of the disease on the national economy [11, 12].

This study had a few limitations that deserve consideration while interpreting the results. First, it should be noted that the respondents in this study may not be a true representation of the diabetic population in Nigeria, especially as the study was conducted in a single tertiary healthcare facility. Second, due to the self-reporting nature of the study, recall and social desirability bias might have also been possible. Third, data of the excluded patients were not collected, therefore this may have altered the overall results if the data had been collected and analyzed. Fourth, because of the cross-sectional design of the study, respondents were assessed at one point in time with one MAUI, therefore fluctuations may occur if their health status was measured at various times with more than one MAUI. Finally, the choice of the EQ-5D-5L as the instrument to define the different domains of HRQoL needs justification. The measure is limited in that there are only five domains, with five possible levels on each domain. The content validity may be questioned as important areas that contribute to QoL, such as cognitive function and energy, may be excluded; however, even with this relatively crude measure, 3125 hypothetical health states can be defined. Despite the shortcomings of the instrument, the EQ-5D appeared to be reliable and relatively insensitive to cultural context [29].

5 Conclusion

The results of this study revealed a relatively low health status among type 2 diabetes patients in Nigeria. Old age was a major contributor to patients' low health status in both the EQ-VAS score and utility valuations, while the presence of other illnesses, duration of diabetes and level of education significantly impacted utility valuations negatively, negatively, and positively, respectively.

Author Contributions MOA conceived and designed the study, SON analyzed and interpreted the data, AI drafted the article, and CA participated in the data acquisition and drafting of the article. MOA approved the final version to be submitted.

Compliance with Ethical Standards

This study was approved by the appropriate institutional research Ethics Committee and has been performed in accordance with the ethical standards of the Declaration of Helsinki. Informed consent was obtained from all individual participants included in the study.

Conflicts of interest Maxwell Ogochukwu Adibe, Chibueze Anosike, Sunday Odunke Nduka and Abdulmuminu Isah have no financial or nonfinancial conflict of interests.

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Data Availability Statement The data for this study are available as electronic supplementary material.

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