# We are IntechOpen,
# the world's leading publisher of
# Open Access books
# Built by scientists, for scientists

## 5,600
Open access books available

## 137,000
International authors and editors

## 170M
Downloads

## 154
Countries delivered to

Our authors are among the

## TOP 1%
most cited scientists

## 12.2%
Contributors from top 500 universities

**BOOK CITATION INDEX**
CLARIVATE ANALYTICS
INDEXED

**WEB OF SCIENCE™**

Selection of our books indexed in the Book Citation Index
in Web of Science™ Core Collection (BKCI)

## Interested in publishing with us?
## Contact book.department@intechopen.com

Numbers displayed above are based on latest data collected.
For more information visit www.intechopen.com

# Predictors of Health-Related Quality of Life among Patients with Diabetes Mellitus

*Bikila Regassa Feyisa*

## Abstract

The health of general population cannot be well characterized from the analyses of mortality and morbidity statistics alone, particularly for patients of chronic diseases including diabetes mellitus. It is equally important to contemplate health in terms of people's assessment of their sense of well-being and ability to perform social roles. A number of reasons are there to measure the health-related quality of life among patients with diabetes mellitus. For one thing, diabetes patients are highly interested in functional capacity and well-being. On the other hand, patients in the same clinical manifestations might have different responses. Either general or specific instruments could be utilized to measure the health-related quality of life of diabetes patients. Choice of the instrument depends on time of the measurement, validity of the instrument and the interpretability. In Ethiopia, short form 36 (SF-36) instruments were utilized and the highest (63.2 ± 34.4) and the lowest (30.2 ± 22.9) mean score scored in physical functioning and general health domain respectively. The study indicated that age, sex, marital status, educational status, feeling of stigmatized, co-morbidity status, chronic complication and body mass index are some of the predictors of health-related quality of life for patients living with diabetes mellitus.

**Keywords:** Health-related quality of life, diabetes mellitus, Ethiopia

## 1. Introduction

Diabetes mellitus (DM) is a chronic disease that occurs when the pancreas fails to produce enough insulin or when the body's insulin is not used correctly. There are numerous forms of diabetes, and each form is caused by a complex mix of genetics and environmental factors. Type 1 and type 2 diabetes mellitus are two basic classifications of the disease. Chronic high blood glucose levels (>126 mg/dl for fasting blood sugar and/or a 2-hour postprandial glucose of 200 mg/dl, or if the individual experienced symptoms of diabetes and random plasma glucose of 200 mg/dl (confirmed by repeat testing) are indications of diabetes [1–3].

Diabetes mellitus (DM) is a rising condition that has a significant influence on health and quality of life. It is seen as a pressing public health issue that has the potential to negatively impact health-related quality of life [2, 4, 5]. In 2015, around 8.8% of persons aged 20 to 79 had diabetes worldwide. Over 2030, this tendency is expected to reach 366 million cases, rising to 642 million cases (one in every ten individuals) by the next decade. Around 75% of them were from low- and middle-

income nations. Diabetes was responsible for over 5 million deaths worldwide between the ages of 20 and 99 [6–8].

The increasing burden of diabetes has also great economic impact directly for medical costs and indirectly by loss of jobs and wages. The global healthcare expenditure on people with diabetes was estimated to be USD 850 billion in 2017 [3, 8].

There is now an universal agreement that the general population's health cannot be adequately assessed solely through the analysis of mortality and morbidity statistics, and that health must also be considered in terms of people's perceptions of their sense of well-being and ability to perform social roles [9, 10].

This evaluation could be correct if the health-related quality of life of individuals, particularly those with chronic illness, could be accurately assessed. The phrase "health-related quality of life" (HRQoL) refers to a multifaceted notion that considers how patients are affected by sickness and treatment. It can assess patients' views of sickness and treatment, as well as their perceived needs for healthcare providers, treatment preferences, and disease outcomes [11, 12].

The subjective and objective assessments of an individual with particular conditions are included in health-related quality of life. The word is used because there are many parts of life that are highly valued but are not considered to be "healthy." It's been described as "an overall general well-being that includes objective descriptors and subjective evaluations of physical, material, social, and emotional well-being, as well as the extent of personal development and purposeful activity, all weighted by a personal set of values [13]."

Although clinicians and experienced professionals can assess the severity of the condition and the extent to which it has progressed, their assessment of the clients' health-related quality of life may differ from the patients' personal perspective. This is because psychosocial and cultural factors may have a significant impact on patients' personal perspectives [3].

Diabetes mellitus has a negative impact on patients' HRQoL. This, in turn, has an impact on many aspects of a person's life, including the psychological impact of being chronically ill, dietary restrictions, social changes, and imprecise symptoms of an inadequate metabolic system, chronic complications, and, eventually, lifelong infirmities [14, 15].

The objective of chronic care are not to cure but to enhance functional status, minimize distressing symptoms, prolong life through secondary prevention and improve the quality of life [16].

Diabetes Mellitus also has a profound effect on social, economic, physical, psychological, behavioral and clinical conditions of the person affected. These effects will have a great impact on the health-related quality of life and it is one of the most psychologically demanding of the chronic diseases; with psychosocial factors pertinent to nearly every aspect of the disease and its treatment [11].

## 2. Health-related quality of life and chronic diseases

Health status, functional status, and quality of life are the three categories of health that are most frequently used interchangeably [17]. The health domains vary from death, which is one of life's adversely valued features, to extreme happiness or full functioning, which is one of life's favorably valued aspects. The rationale for assessing health and the specific concerns of patients, clinicians, and researchers in the subject of study usually determine the definition's boundaries.

While income level, independence, and environmental quality may all play a role in determining HRQoL, they do not directly affect people's health or medical

concerns. HRQoL is the right focus for clinicians, having in mind that when a patient is suffering from disease or illness, practically every area of their life might become health-related.

## 3. Why measure health-related quality of life?

Measuring HRQoL is becoming more widely accepted as a means of assessing the effects of chronic illness [18]. Physiological measurements are useful for physicians, but they are of little interest to patients, and they often have poor correlations with functional capability and well-being, which are the areas in which patients are most interested. Variations in exercise capacity among patients evaluated in the laboratory, for example, are very weakly connected to differences in the ability to conduct day-to-day activities in patients with chronic heart and lung illness [19]. Another reason to test HRQoL is the typical occurrence of two patients with the same clinical criteria having vastly different responses. Two patients with the same forced expiratory volume in 1 s and even the same exercise capacity in the lab, for example, may have different role functions and emotional well-being. While one patient may be able to continue working without experiencing sadness, another may be forced to leave their job and suffer from a major depression [19, 20].

These reasons explain why the impact of medical therapies on HRQoL are of great interest to patients, doctors, and healthcare executives [20]. HRQoL is of special importance to managers since the patient mix influences consumption and expenditure patterns. HRQoL is increasingly being used as a measure of care quality and clinical efficacy, and payers are beginning to factor HRQoL data into payment decisions.

## 4. Types of health-related quality of life measures

### 4.1 Generic instruments-health profile

HRQoL assessments can be classified into two categories: generic and specific. Single indicators, health profiles, and utility measures are some of the generic instruments available. Health profiles are tools that seek to quantify all components of HRQoL. The Sickness Impact Profile (SIP) is a health profile that includes a physical dimension (ambulation, mobility, body care, and movement); a psychosocial dimension (social interaction, alertness behavior, communication, and emotional behavior); and five independent categories (eating, work, home management, sleep and rest, recreations, and pastimes). Because of its broad breadth, using health profiles provides an advantage. Generic instruments allow for comprehensive evaluations of the relative impact of various healthcare initiatives since they apply to a wide variety of people. Generic profiles, on the other hand, may be less responsive to changes in specific situations [21].

### 4.2 Specific instruments

The second basic strategy to assessing quality of life focuses on features of health that are relevant to the major concern. The reason for this strategy is that it has the potential to boost responsiveness by focusing on only the most significant parts of HRQoL that is relevant to the patients being examined. The instrument could be tailored to a condition (such as diabetes or heart failure), a patient demographic (such as the frail elderly), a specific function (such as sleep or sexual function), or a problem (such as pain). Aside from the possibility of better responsiveness, specific

measures have the advantage of being directly related to areas that clinicians usually investigate.

Health-related quality of life can be assessed using one of the following methods: telephone, self-administered, or replacement responders. Each strategy has its own set of advantages and disadvantages. Aside from the possibility of better responsiveness, specific measures have the advantage of being directly related to areas that clinicians usually investigate. For example, interviewer administered has a high response rate, few or no missing items, and few misinterpretation errors, but it involves a lot of resources, including interview training. It may also make people less reluctant to admit they have a problem. The telephone administration is similar to the interviewer-administered one, although it may limit the instrument combinations. However, when using a self-administered strategy, just a little amount of resources are used, which increases the chances of a poor response rate, missing items, and misunderstanding. In another strategy, termed replacement responders, stress for the target group is lessened but the perspective of the substitutes may be different from the target group [21].

**4.3 Which HRQoL Instrument to use?**

Certain factors are there to identify whether the instrument to measure HRQoL is good or bad. Some of them are listed as follows:

- **Time of measurement**: It should be clearly indicated whether one is measuring at a point in time or measuring a change over time? The goal of HRQoL measurement includes identifying between people who have better, moderate or worse HRQoL, *discriminative instrument,* and measuring to what extent the HRQoL of the people changed, *evaluative instrument*. In this regards, instrument and the characteristic features of the clients must be taken in to account before deciding which type of instrument measure the HRQoL.

- **The Validity of the instrument**: Validity refers to whether an instrument measures what it intends to measure. In this regard, the presence of the gold standard matters to use the given tool. To use validity when there is a gold standard instrument, one must determine using 'criterion validity'. If the results of an instrument fit the criterion standard, it is called genuine. When a shorter version of an instrument (the test) is used to predict the results of the full-length index, for example, criterion validity is applicable (the gold standard). Another example is predicting mortality using an HRQL instrument. Another example is predicting mortality using an HRQL instrument. In this case, the instrument will be valid to the extent that the questionnaire results explain variation in patient survival (the gold standard) (the test). Individual evaluations of physiological, physical, psychological, and social well-being are included in self-ratings of health, as are more extensive and longer assessments of general health views. Self-ratings of perceived health are a significant predictor of mortality [21, 22]. In the absence of a gold standard, HRQoL researchers adopt validation procedures from clinical and experimental psychologists who have struggled for years to determine whether questionnaires assessing intelligence, attitudes, and emotional function are measuring what they are supposed to measure. Content and construct validity are two types of validity that psychologists have introduced [21].

- **Interpretability:** The 'interpretability' of an HRQL metric is a final important feature. A discriminative tool may be used to determine if a given score

indicates that a patient is functioning properly or has mild, moderate, or severe HRQL impairment. One can question whether a given change in score reflects a trivial, minor but significant, moderate, or major improvement or deterioration for an evaluative instrument [21].

## 5. The structure of health-related quality of life measures

Some HRQ0L measurements are as simple as asking the patient, "How is your quality of life?" [23]. This question can be asked in a straightforward or complex manner, with either option producing restricted results. HRQoL tools are often questionnaires with a number of elements or questions. Domains are made up of items (also sometimes called dimensions). The area of behavior or experience that is being measured is referred to as a domain or dimension. Mobility and self-care are two domains that can be combined to form physical function, sadness, anxiety, or well-being, which can then be combined to produce an emotional function domain. Because it comprises eight aspects rather than a single summative measure, the short form 36 (SF-36) is one of the finest ways for measuring HRQoL in chronic conditions. Physical functioning, Social functioning, Bodily pain, Role limitations caused by physical health problems (Role/physical), Role limitations caused by emotional problems (Role/emotional), Emotional well-being (Mental health), Energy/fatigue (Vitality), and General health perceptions are all evaluated by questions in the eight dimensions. These eight aspects can be summarized into two components: physical health component summary and mental health component summary. Physical functioning, role limitations due to physical health problems, bodily pain, and general health perception are included in the physical health component summary, whereas social functioning, role limitations due to mental health problems, and general health perception are included in the mental health component summary. Each of the eight dimensions expressly assesses the patients' quality of life, such as;

**Physical Function (PF):** The degree to which health restricts physical activities like walking, self-care, stair climbing, lifting, and workouts.

**Role Physical (RF):** The degree to which physical health interferes with work, such as completing fewer tasks and having difficulty executing activities.

**Body Pain (BP):** The severity of pain and how it affects one's ability to work.

**Vitality (VT):** is the difference between feeling energized and exhausted and worn out.

**Social Functioning (SF):** The degree to which physical or emotional difficulties obstruct social activity.

**Emotional Role (RE):** The degree to which emotional issues interfere with work, such as decreased time spent on activities and completing fewer tasks.

**Mental Health (MH):** General mental health, including depression, anxiety, behavioral-emotional control.

**General Health (GH):** The degree to which one can subjectively judge his or her health condition in comparison to that of a year ago, as well as the level of physical activity.

These eight components are added together to form overall HRQoL, allowing the level of HRQoL of patients/clients to be calculated. Each raw scale score was turned into a 0–100 scale after the score for each domain was obtained by adding each item under each domain. The overall HRQoL was then determined by multiplying each converted domain score by eight to get the overall HRQoL (number of domains). The higher the total score, the higher the quality of life; the lower the score, the poorer the quality of life. Scores of 45 poor/bad/low HRQoL, 46–65 moderate HRQoL, and > 65 relatively high HRQoL are used to interpret the final score for the total score [24, 25].

## 6. Predictors of health-related quality of life among patients with diabetes mellitus

From the study conducted among patients with diabetes mellitus on follow-up at one of the public specialized hospitals in Ethiopia, age, sex, marital status, educational status, smoking history, feeling of stigma, co-morbidity status, chronic complication and body mass index (BMI) were the potential predictors of HRQoL. The study indicated that, the overall HRQoL of patients with diabetes on follow-up at the study area was found to be moderate. General health, mental health, bodily pain and vitality were the most affected domains of HRQoL [24].

The study participants' overall HRQoL was found to have a transformed mean score of 50.318.1, with minimum and maximum scores of 16.4 and 79.1, respectively. The study participants had the highest (63.234.4) mean score in physical functioning and the lowest (30.222.9) mean score in the overall health domain among the eight domains of HRQoL. When the HRQoL was decomposed into domains, general health, mental health, bodily pain, and vitality all had a mean score below 50, indicating that they were the most affected (**Table 1**).

Principal component analysis (PCA) was also used to construct two-component HRQoL scores, with 66.77 percent of the total variance explained. The mental component score had a higher mean score (51.7716.72), with a maximum score of 80.75 (Appendices A-C).

According to this study, socio demographic status (age, sex, marital status, educational status), socio cultural status (feeling of stigmatized), behavioral factors (history of smoking) and clinical factors (co-morbidity status, chronic complication and body mass index are some of the predictors of health-related quality of life for patients living with diabetes mellitus [24]. Multiple linear regression was applied for the final model after controlling for the potential confounders and multicollinearity using variable inflation factor (VIF) (**Table 2**).

| Domains of HRQoL, Overall HRQoL, PCS and MCS | Mean | SD | Minimum score (%) | Maximum score (%) |
|---|---|---|---|---|
| Physical Functioning (PF) | 63.19 | 34.36 | 14.4 | 97.6 |
| Social Functioning (SF) | 56.04 | 30.13 | 12.9 | 98.6 |
| Role limitation due to physical health (RP) | 53.37 | 44.8 | 8.6 | 98.2 |
| Role limitation due to emotional problem (RE) | 52.71 | 45.82 | 6.97 | 98.6 |
| Emotional wellbeing (MH) | 49.84 | 8.02 | 20.0 | 72.0 |
| Bodily Pain (BP) | 48.60 | 11 | 12.5 | 80.0 |
| Energy/Fatigue (VT) | 48.47 | 7.78 | 20.0 | 75.0 |
| General Health (GH) | 30.21 | 22.95 | 7.3 | 95.0 |
| Overall HRQoL | 50.30 | 18.08 | 16.8 | 79.1 |
| Physical Component Score (PCS) | 48.84 | 21.87 | 10.0 | 87.5 |
| Mental Component Score (MCS) | 51.77 | 16.72 | 19.8 | 80.8 |

*HRQoL: health-related quality of life; MCS: Mental Component Score; NSH: Nekemte Specialized Hospital; PCS: Physical Component Score.*

**Table 1.**
*The eight domains of HRQoL, the overall HRQoL and the two component scores of HRQoL with their mean score of diabetic patients at NSH, East Wollega, West Ethiopia, 15th April -5th June, 2019, (n = 215).*

Residence, economic position, occupation, type of diabetes, drug regimen, and duration of diabetes mellitus were not statistically significant predictors of health-related quality of life, as shown in the table above.

Controlling for all other independent factors, the multiple linear regression model revealed that a unit increase in age would likely reduce health-related quality of life of diabetic patients by 0.25 (= − 0.25, 95% CI, −0.43.55, −0.07, p = 0.007). Other literatures also supported this finding [11, 26, 27]. This might be because of the physiological alteration of the patients as they got older. Older individuals are mostly limited in physical activities, coping with pain intensity and relief from pain [28]. However, findings from other parts of Ethiopia, South Africa and the Nordic countries were inconsistent with the current study result where age has no association with HRQoL [29–31].

Being male was positively associated with better HRQoL compared to their counter parts ($\beta$ = 5.23, 95% CI, 1.10–9.36, p = 0.013). Literatures are inconsistently explaining in this regard [11, 12, 27, 32, 33]. This disagreement could be due to the gender impact as most of the time women are treated inferiorly. They are less autonomous in giving decision on behalf of their rights. Moreover, evidences showed that women were more likely affected by DM than males. Women also are more susceptible to the risk of central obesity when compared to men which in turn lead to the enhancement of the risk of complication of DM. This greatly reduces HRQoL of the clients [34]. As for marital status, being married was positively associated as it would likely increase the HRQoL by 5.30 units compared to those who were single controlling for all other independent variables ($\beta$ = 5.30, 95% CI, 0.88–10.52. P = 0.046). The psychological stability and better social interaction when compared to those who are not in marriage would contribute for the association [29].

Regarding the educational level the respondents achieved, unable to read and write would likely decrease the HRQoL by 8.81 units ($\beta$ = − 8.81, 95% CI,-14.88 to −2.82, P = 0.004) compared to those who achieved college and above after controlling for all other predictors.

The history of smoking was found to affect the HRQoL status of the patients with diabetes. Having smoking history would likely decrease the HRQoL by 9.03 units ($\beta$ = − 9.03, 9 5% CI, −15.23- -4.69, P < 0.001) compared to their counter parts. Centers for Diseases Control and Prevention (CDC) and other study from USA indicated that Smokers are more likely to have central fat accumulation than non-smokers, and smoking is known to induce insulin resistance and compensatory insulin secretion responses, which could explain the increased risk of diabetes in those who smoke [35]. In the same way, feeling of stigmatized because of being patient with diabetes would likely decrease HRQoL by 5.25 units ($\beta$= − 5.25, 95% CI, −8.94 to −1.56, P = 0.005) compared to their counterparts controlling all other predictors. Multifaceted restrictions that the DM patients are facing, for example, the amount, type and timing of food consumed would attribute to the unsuitability of their social interaction. This in turn leads to the poorer HRQoL.

The absence of co morbid conditions and chronic complications related to diabetes mellitus increased HRQoL compared to their counter parts. In both cases, the absence of the condition would likely increase the HRQoL by about 6 units. As for BMI, the increase in one unit of BMI would likely decrease the HRQoL by 3.56 units ($\beta$= − 3.56, 95% CI,-6.94- -0.18, P = 0.009). This could be attributed that co morbid conditions are another challenge that could put the patients in disturbing conditions. Patients might seek healthcare for both or above diseases in which case they were emotionally diseased, the role due to emotional problem might be disputed. All the domains of HRQoL directly or indirectly would be affected. In another way,

| Variables | Unstandardized coefficient | | Standardized coefficient | 95% CI | | P-value |
|---|---|---|---|---|---|---|
| | *B* | SE | *β* | Lower | Upper | |
| (Constant) | 69.41 | 10.31 | | 49.16 | 89.74 | 0.000 |
| **Sex** | | | | | | |
| Female | 1 | 1 | 1 | 1 | 1 | 1 |
| Male | 5.23 | 2.11 | 0.14 | 1.10 | 9.36 | **0.013**[*] |
| Age | -0.25 | 0.08 | -0.20 | -0.43 | -0.07 | **0.007**[*] |
| **Marital status** | | | | | | |
| Single | 1 | 1 | 1 | 1 | 1 | 1 |
| Married | 5.30 | 2.69 | 0.11 | 0.88 | 10.52 | **0.046**[*] |
| Divorced | -4.60 | 5.26 | -0.04 | -14.98 | 5.78 | 0.38 |
| Widowed | -4.07 | 3.42 | -0.07 | -10.81 | 2.67 | 0.24 |
| **Educational status** | | | | | | |
| Cannot read and write | -8.81 | 3.06 | -0.19 | -14.88 | -2.82 | **0.004**[*] |
| Grade 1-8 | -2.94 | 2.49 | -0.07 | -7.84 | 1.97 | 0.24 |
| Grade 9-12 | 0.04 | 2.62 | 0.001 | -5.13 | 5.22 | 0.98 |
| College and above | 1 | 1 | 1 | 1 | 1 | 1 |
| **Smoking history** | | | | | | |
| Yes | -9.03 | 2.66 | -0.21 | -15.23 | -4.69 | **0.000**[**] |
| No | 1 | 1 | 1 | 1 | 1 | 1 |
| **Feeling of stigmatized** | | | | | | |
| Yes | -5.25 | 1.89 | -0.15 | -8.94 | -1.56 | **0.005**[*] |
| No | 1 | 1 | 1 | 1 | 1 | 1 |
| **Co morbidity status** | | | | | | |
| Yes | 1 | 1 | 1 | 1 | 1 | 1 |
| No | 6.05 | 2.18 | 0.16 | 1.78 | 10.33 | **0.006**[*] |
| **Chronic complication status** | | | | | | |
| Yes | 1 | 1 | 1 | 1 | 1 | 1 |
| No | 6.04 | 2.28 | 0.11 | 1.54 | 10.53 | **0.009**[*] |
| BMI | -3.56 | 1.71 | -0.12 | -6.94 | -0.18 | **0.040**[*] |
| DM Duration | 0.15 | 1.10 | 0.01 | -2.02 | 2.33 | 0.89 |
| **Types of DM** | | | | | | |
| Type 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Type 2 | 4.45 | 2.39 | 0.12 | -0.24 | 9.17 | 0.064 |
| **Drug regimen** | | | | | | |
| Insulin only | 1 | 1 | 1 | 1 | 1 | 1 |
| OHA | -5.66 | 3.46 | -0.16 | -12.48 | 1.15 | 0.103 |
| Both | -1.42 | 4.02 | -0.02 | -9.35 | 6.51 | 0.72 |

*Dependent Variable: Overall health related quality of life, VIF: Variable Inflation Factor, VIF max = 4.16.*
[*]*P < 0.05.*
[**]*P < 0.001, Adjusted $R^2$ = 0.536, F = 16.46.*

**Table 2.**
*Multiple linear regression analysis of diabetic patients on follow up at NSH, East Wollega , West Ethiopia, 15th April -5th June, 2019, (n = 215).*

those who developed chronic complications would also live under the double crisis. In one way, they felt unhappy about being patient with diabetes, and in another way, they would be under psychological, physical, emotional, social, and spiritual agony.

In conclusion, the present study identified that the HRQoL of patients with diabetes on follow-up at NSH was moderate. Domains of general health, mental health, bodily pain, and vitality were the most affected domains among the patients with diabetes. Sex, age, education status, marital status, history of smoking status, BMI, the feeling of stigma status, comorbidity status, and diabetic-related chronic complication status were predictors of HRQoL identified in this study.

It is recommended that health policy makers should give due attention for the overall HRQoL of the patients with diabetes on follow up at health institutions in addition to the existing treatment focused guidelines. Health care providers should also give emphasize to general health, mental health, bodily pain and vitality of the patients. Well scheduled, regular and continuous diabetic health education has to be provided as equally as important with the usual treatment and care for the patients. Respecting and understanding the patients' feeling has to be put first.

Moreover, health researchers should conduct further longitudinal studies with larger sample size in order to generalize the overall HRQoL of patients with diabetes at national level. Experimental and qualitative study design needs to be considered focusing the life style modification on patients with DM.

## Annexes

### A. Correlation matrix

| | PF | RP | VT | MH | BP | GH | RE | SF | Overall HRQoL |
|---|---|---|---|---|---|---|---|---|---|
| **Correlation Matrix** | | | | | | | | | |
| PF | 1.000 | | | | | | | | |
| RP | .631 | 1.000 | | | | | | | |
| VT | .089 | .127 | 1.000 | | | | | | |
| MH | .125 | .208 | .294 | 1.000 | | | | | |
| BP | .043 | .092 | -.018 | -.002 | 1.000 | | | | |
| GH | .455 | .511 | .133 | .113 | -.030 | 1.000 | | | |
| RE | .380 | .683 | .071 | .191 | .034 | .274 | 1.000 | | |
| SF | .590 | .640 | .166 | .276 | .042 | .549 | .327 | 1.000 | |
| Overall HRQoL | .763 | .916 | .207 | .301 | .128 | .637 | .747 | .765 | 1.000 |

### B. Anti-image correlation (measures of sampling adequacy) of the fitted domains

| | PF | RP | VT | MH | GH | RE | SF | BP | Overall HRQoL |
|---|---|---|---|---|---|---|---|---|---|
| PF | 0.74 | | | | | | | | |
| RP | | 0.65 | | | | | | | |
| VT | | | 0.64 | | | | | | |
| MH | | | | 0.55 | | | | | |

| | PF | RP | VT | MH | GH | RE | SF | BP | Overall HRQoL |
|---|---|---|---|---|---|---|---|---|---|
| GH | | | | | 0.78 | | | | |
| RE | | | | | | 0.52 | | | |
| SF | | | | | | | 0.89 | | |
| BP | | | | | | | | 0.48 | |
| Overall HRQoL | | | | | | | | | 0.62 |

## C. Table showing the rotated component matrix

| Domains | Component 1 | Component 2 |
|---|---|---|
| Physical functioning | 0.83 | |
| Role physical | 0.85 | |
| Vitality | | 0.81 |
| Metal Health | | 0.79 |
| General health | 0.75 | |
| Social functioning | | 0.83 |
| Role emotional | | 0.68 |
| Bodily pain | 0.48 | |

## Author details

Bikila Regassa Feyisa
Wollega University, Nekemte, Ethiopia

*Address all correspondence to: bikregasa@gmail.com;
bikilareg@wollegauniversity.edu.et

IntechOpen

## References

[1] American Diabetes Association. Standards of Medical Care for Patients. 2002;25(1):s33–49.

[2] Center for disease control and prevention. National Diabetes Fact Sheet , 2008.

[3] Trikkalinou A, Papazafiropoulou AK MA. World Journal of Diabetes. *Diabetol Metab Syndr.* 2017;8(4):120–71.

[4] Center for control and Prevention of diseases. Smoking and diabetes, 2014. Available from:https://www.cdc.gov/tobacco/data_statistics/sgr/50th-anniversary/pdfs/fs_smoking_diabetes_508.pdf.[cited 28Mar, 2019]

[5] Bommer C, Sagalova V, Heesemann E, Manne-goehler J, Atun R. Global Economic Burden of Diabetes in Adults : Projections From 2015 to 2030. 2020;41:963–70.

[6] International Diabetes Federation. IDF Diabetes Atlas : Global estimates of diabetes prevalence for 2017 and projections for 2045. *Diabetology & Metabolic Syndrome*. Elsevier B.V.; 2015. Available from: https://doi.org/10.1016/j.diabres.2018.02.023

[7] International Diabetes Federation. IDF DIABETES ATLAS. 2015.

[8] Al-shehri AH, Taha AZ, Bahnassy AA, Salah M. Health-related quality of life in type 2 diabetic patients. 2008;25(5):352–60.

[9] Kebede D, Alem A, Shibre T, Deyessa N. Health related quality of life ( SF-36 ) survey in Butajira , rural Ethiopia : Normative data and evaluation of reliability and validity. 2004;289–97.

[10] Dinesh Khanna JT. Health-related Quality of Life- An Introduction. *Am J Manag Care*,. 2007;13(9):218–23.

[11] Goli M, Salarvand S, Dehvan F, Ghafouri H, Dalvand S. Health-Related Quality of Life in Iranian Patients with Thalassemia Major : A Systematic Review and Meta-Analysis. 2018;6(59): 8483–94.

[12] Sreedevi A, Cherkil S, Kuttikattu DS, Kamalamma L, Oldenburg B. Validation of WHOQOL-BREF in Malayalam and Determinants of Quality of Life Among People With Type 2 Diabetes in Kerala , India. 2016; 28(1s):62S–69S.

[13] Athanasia K. Papazafiropoulou, Florentia Bakomitrou, Aikaterini Trikallinou et al. Diabetes- dependent quality of life ( ADDQOL ) and affecting factors in patients with diabetes mellitus type 2 in Greece. *BioMed Central*; 2018;10(23):4–9.

[14] Hayek AA Al, Robert AA, Saeed A Al, Alzaid AA, Sabaan FS Al. Factors Associated with Health-Related Quality of Life among Saudi Patients with Type 2 Diabetes Mellitus : A Cross-Sectional Survey. 2014;38:220–9.

[15] Anderson BJ, Laffel LM, Domenger C, Danne T, Phillip M, Mazza C, et al. Factors Associated With Diabetes- Specific Health-Related Quality of Life in Youth With Type 1 Diabetes : *The Global TEENs Study*. 2017;40:1002–9.

[16] James P. Boyle, Amanda A. Honeycutt, K.M Venkat Narayan, Thomas J.Hoerger,Linda S.Geiss, Homg Chen, et al. Projection of Diabetes Burden Through 2050. *Diabetes Care* 2001;24(11):1936–40.

[17] Patrick D, Bergner M. Measurement of health status in the 1990s. *Annu Rev Public Health* 1990; 11:165-83.

[18] Patrick DL, Erickson P. Health Status and Health Policy: Quality of Life

in Health Care Evaluation and Resource Allocation. New York: Oxford University Press, 1993.

[19] Guyatt GH, Thompson PJ, Berman LC, et al. How should we measure function in patients with chronic heart and lung disease? *J Chron Dis* 1985; 38:517-24.

[20] Weinberg JE. Outcomes research, cost containment, and the fear of health care rationing. N *Engl J Med* 1990; 323: 1202-4.

[21] Gordon H Guyatt. Measuring health-related quality of life: General issues. *Can Respir J* Vol 4 No 3 May/ June 1997.

[22] Mossey J, Shapiro E. Self-rated health: a predictor of mortality among the elderly. *Am J Public Health* 1982; 72: 800-9.

[23] Torrance GW. Measurement of health state utilities for economic appraisal. *J Health Econ* 1986; 5:1-30.

[24] Feyisa BR, Yilma MT, Tolessa BE. Predictors of health-related quality of life among patients with diabetes on follow-up at Nekemte specialized Hospital, Western Ethiopia: a cross-sectional study. *BMJ Open,* 2020; 10: e036106. Doi: 10.1136/ bmjopen-2019-036106.

[25] W.Bani Issa. Evaluation of health related quality of life of Emirati people with diabetes: Integration of sociodemographic and disease related variables. *Eastern Mediterranian Health Journal*, 2011; 17(11):825-830.

[26] Kakhki AD, Abed Z. Health-related quality of life of diabetic patients Tehran. *Int J Endocrinol Metab* 2013;11: 1–6.

[27] Wegeberg A-ML, Meldgaard T, Hyldahl S, et al. Quantities of comorbidities affects physical, but not mental health related quality of life in type 1 diabetes with confirmed polyneuropathy. *World J Diabetes* 2019; 10:87–95.

[28] Daya R, Zbayat FJR. Effects of diabetes mellitus on health-related quality of life at a tertiary hospital in South Africa : A cross-sectional study. *Diabetol Metab Syndr* 2018;10:918–28.

[29] Wändell PE. Quality of life of patients with diabetes mellitus an overview of research in primary health care in the Nordic countries. *Diabetol Metab Syndr* 2018;10.

[30] Muze M, Hailu E, Woldemichael K, et al. Health related quality of life and its associated factors among diabetic patients attending diabetes clinic in Jimma university teaching hospital. *Diabetol Metab Syndr* 2018;10:7–11.

[31] Del Core MA, Ahn J, Wukich DK, et al. Gender differences on SF-36 patient-reported outcomes of diabetic foot disease. *Int J Low Extrem Wounds* 2018;17:1–7.

[32] Gillani SW, Ansari IA, Zaghloul HA, et al. Bridging glycated hemoglobin with quality of life and health state; a randomized case–control study among type 2 diabetes patients. *Diabetol Metab Syndr* 2018;10:1–10.

[33] Qin W, Blanchette JE, Murrock C. Exploring the relationship between lifestyle behaviors and health-related quality of life among older adults with diabetes. *Diabetes Educ* 2019;45:96–104.

[34] Tang TS, Brown MB, Funnell MM, et al. Social support, quality of life, and self-care behaviors among African Americans with type 2 diabetes. *Diabetes Educ* 2008;34:266–76.

[35] Ware JE, Sherbourne CD. The mos 36-item short-form health survey (SF-36). *Med Care* 1992;30:473–83.