

# Health-Related Quality of Life and Associated Factors Among Type Two Diabetic Patients on Follow-Up in Dessie Comprehensive Specialized Hospital, Dessie, North East Ethiopia, 2020

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**Background:** Diabetes mellitus is a disorder of carbohydrate metabolism and it is highly related with diminished HRQOL in Ethiopia; diabetic related complications especially bring major negative impacts on HRQOL.

**Objective:** To assess HRQOL and associated factors among type two diabetic patients in Dessie Comprehensive Specialized Hospital, north east Ethiopia, 2020.

**Methods:** Institutional-based cross-sectional study design was conducted on 417 patients through systematic random sampling technique from February 08 to April 08, 2020. WHO HRQOL 26 items were used to measure outcome variable. Face-to-face interview, document review and measurement were implemented to collect data. The data were analyzed by IBM SPSS Statistics version 25 and summarized by using tables. Simple linear regression analysis was done and forwarded to multivariable linear regression analysis at p-value <0.25. Next multivariable linear regression analysis was done and variables whose p-value less than 0.05 with unstandardized B-coefficient were declared significant predictor variables.

**Results:** The mean scores of physical domain, psychological domain, environmental domain and social domain were 48±6.7 (47–49), 52±4.2 (50–52.3), 48.9±3.4 (48–50.4) and 49±4 (48–50), respectively. As age increased by one year, patients' physical HRQOL decreased by 0.031 factor, keeping effect of other variables constant [–0.031, 95% CI (–0.050 to –0.013)]. As duration of diabetes increased by one year, patients' physical HRQOL increased by 0.034 factor, keeping effect of other variables constant [0.034, 95% CI (0.004 to 0.065)]. In general, age, depression, perceived social stigma, self-employed, having two complications, widowed, insulin and oral anti-diabetic medication affected HRQOL negatively and duration of diabetes in physical domain and university level of education in environmental domain affected HRQOL positively.

**Conclusion and Recommendation:** The mean score of health-related quality of life in physical health domain, psychological health domain, social health domain and environmental health domain was recorded nearly half score point out of a hundred. Health professionals should follow a holistic approach to management to address negatively associated predictor variables with HRQOL.

**Keywords:** HRQOL, type II diabetes

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## Introduction

Diabetes is a serious chronic disease that occurs when the pancreas does not produce enough hormones that regulate blood sugar. Type two diabetes is defined

as raised blood glucose level in the body secondary to tissue resistance action of insulin and is the most dangerous cause of blindness, kidney failure, lower limb amputation and other long-term consequences which bring negative impacts on health-related quality of life (HRQOL) in the world.<sup>1,2</sup>

According to the WHO definition, HRQOL is a broad concept which focuses on the measurement of health status with respect to physical health, psychological health, social health and environmental health. HRQOL is assessed by physical health domain, psychological health domain, social health domain and environmental health domain separately.<sup>3,4</sup> Access to essential medicines and technologies appears to be a key obstacle to diabetes management with respect to HRQOL, particularly in low- and middle-income countries.<sup>2</sup>

Currently, Ethiopia has been challenged by the growing magnitude of non-communicable diseases (NCDs) such as diabetes. It is in the top four countries with the highest adult diabetic populations in sub-Saharan Africa and diabetes accounts for 2% of deaths.<sup>6</sup>

When reviewing different studies conducted on HRQOL among type two diabetes mellitus patients, it has a negative impact on physical, social, environmental and psychological domains among adult age groups in the world.<sup>9–15</sup> In addition to this, similar studies conducted in different countries revealed that the burden of diabetic related chronic complications are responsible for high morbidity and mortality with significantly reduced HRQOL among type two diabetic patients in developed and low income countries.<sup>16–21</sup> Depression was also the major determinant factor in HRQOL with respect to physical and psychological domains in developed and low income countries.<sup>17,21,22</sup>

In Ethiopia, diabetic related chronic complications and co-morbidity diseases have negative impact on HRQOL with respect to physical health, psychological health, social health and environmental health.<sup>17–19,24</sup>

Even though previous studies were conducted in Ethiopia, they did not address HRQOL with respect to physical health domain, psychological health domain, social health domain and environmental health domain separately.<sup>18,24</sup> WHO HRQOL guidelines state that linear regression analysis model with respect to physical health domain, psychological health domain, social health domain and environmental health domain separately was the most appropriate to get detailed information.<sup>4,29</sup> Because of this

reason, HRQOL with respect to physical health domain, psychological health domain, social health domain and environmental health domain by using linear regression analysis model separately in order to get appropriate information was used in this study. From the previous studies there were contradicting ideas on some of the predictor variables.<sup>18,22</sup>

Generally in Ethiopia limited studies have pointed out HRQOL and its associated factors on type two diabetic patients. However, no study has been conducted before in South Wollo zone regarding HRQOL and its associated factors. Therefore, the main aim of this study was to assess HRQOL and factors associated with HRQOL with respect to physical health domain, psychological health domain, social health domain and environmental health domain separately by filling the identified gaps in Dessie Comprehensive Specialized Hospital.

This study was aimed to assess HRQOL and associated factors among type two diabetic patients in Dessie Comprehensive Specialized Hospital February to April 2020.

## Methods and Materials

### Study Area

The study was conducted in Dessie Comprehensive Specialized Hospital, north-eastern Ethiopia. Dessie city administration is found far from Bahir Dar (481 kilometers), which is the capital city of Amhara regional state, and 401 kilometers from Addis Ababa, the capital city of Ethiopia. Dessie Comprehensive Specialized Hospital was established in 1942 and it serves a population of 5 million and has 603 health care workers.

The hospital has been given multiple services such as medical, surgical, obstetric, ANC, chronic follow-up, pediatric, orthopedic center service, DM service, ART and follow-up services, etc. In the diabetic clinic follow-up service, a total of 1150 type two diabetic patients are seen in 6 months in this hospital and 1000 diabetic patients were on follow-up at different appointment dates within the study period.

### Study Design and Period

The institutional-based cross-sectional study design was conducted in the Diabetic Clinic of Dessie Comprehensive Specialized Hospital from February 8 to April 8, 2020.

### Source Population

All adult type two diabetic patients who had treatment follow-up in Dessie Comprehensive Specialized Hospital.

## Study Population

All adult type two diabetic patients who were following their diabetic treatment and they had fulfilled the eligibility criteria during the study period.

### Inclusion Criteria

Type two diabetic Patients on treatment follow-up for least one month.<sup>4</sup>

### Exclusion Criteria

Patients who were unable to communicate due to serious medical and psychiatric illness.

### Dependent Variable

Health-related quality of life

### Independent Variables

1. Socio-Demographic Factors: like age, gender, marital Status, educational status, residency, occupational status, average monthly income and community-based health insurance (CBHI).
2. Clinical Factors: like duration of DM, chronic complications, number of complications, BMI, FBS, treatment regimen, waist circumference and comorbidity diseases.
3. Behavioral Factors: like alcohol consumption and cigarette smoking.
4. Psychosocial Factors: like depression and perceived social stigma.

## Operational Definitions

### Health-Related Quality of Life

Diabetes mellitus follow-up patients were assessed using World Health Organization quality of life questionnaires, validated tools which contains a 26-item instrument consisting of four domains: physical health (7 items), psychological health (6 items), social relationships (3 items), and environmental health (8 items), and two items not included in any of the domains (overall perception of QOL and general health perception). Each of these items was scored from 1 to 5 on a response scale, which is agreed as a five point Likert scale. The mean score of items within each domain was used to calculate the domain score, then the mean scores were multiplied by 4 in order to make domain scores comparable with other WHO quality of life tools.<sup>4,29</sup>

### Depressed

An individual participant with a mean score of  $\geq 10$ .<sup>46</sup>

### Non-depressed

An individual participant with a mean score of  $< 10$ .<sup>46</sup>

### Stigmatized

An individual participant whose response is one

### Not Stigmatized

An individual participant whose response is zero

### Cigarette Smokers

According to WHO's Smoking and Tobacco Use Policy, a smoker is someone who smokes any tobacco product, either daily or occasionally.

### Alcohol Use

Current alcohol use is defined as any use of alcohol in the past 30 days.

### Co-Morbidity

The occurrence of multiple health conditions in the same person before diabetic disease diagnosis.

## Sample Size Determination

The required number of minimum sample size was determined using a single mean formula by taking mean of social domain  $SD = 14.8$ , 95% Confidence level,  $E = 1.49$ , maximum error of estimation.

$$n = (Z\alpha/2)2 * s^2 / E^2, \text{ where use, } E = 1.49$$

Social domain  $HRQOL = 57.8 \pm 14.8$ ,  $(1.96)^2 * (14.8)^2 / (1.49)^2 = 379$  take none response rate, 10%,  $379 * 10\% = 37.9$ , then total sample size = 417

## Sampling Technique and Sampling Procedure

By using a systematic random sampling method the required sample was selected. First, the total number of type two diabetic patients who have on treatment follow-up at different appointment dates within the study period were obtained by counting lists of appointments in the registration book from the last year, then "Kth" value was calculated as follows =  $1000/417 = 2$  whereas,  $N = 1000$ ,  $n = 417$  next to this the first participant was selected by random lottery method and the next participant was selected every 2 interval until the sample size was fulfilled.

### Data Collection Tool and Procedures

The first part of questionnaire contains socio-demographic data which was developed from the literature review and conceptual framework. The second part of the

questionnaire tool was adopted from the WHOQOL-BREF 26 item, validated checklist.<sup>4,29</sup> The third part of the questionnaire contains clinical factors, behavioral factors and psychosocial factors and were developed from the literature review and conceptual framework. Among these, depression, perceived social stigma and smoking cigarettes were assessed by adopting the validated checklist in Ethiopia.

Three BSc Nurses were assigned from Dessie health center. Among these nurses, two were assigned as data collectors and one was assigned as supervisor. The data collection was implemented through face-to-face interview, direct anthropometry measurement (Seca240 weight measuring tool, stadiometer height measurement tool and waist circumference by meter), taking the laboratory measurement result and at the same time, patients' documents were reviewed by the data collectors. Lastly, the data collection activities were performed from February 08 to April 08, 2020.

### Data Quality Control

All questionnaires were translated from English language version to Amharic language version and also retranslated into English language version to ensure its consistency.

Data collectors and the supervisor were given training for two days duration to collect appropriate data from the study participants. Pretest was done on 10% of the population a week before the actual data collection period in Boru Meda hospital. During the pretest the internal consistency of the tool was assessed by computing the Cronbach's alpha (physical = 0.79, psychological = 0.85, environmental = 0.76 and social = 0.80) and for independent variables (depression = 0.75, perceived social stigma = 0.78) which was acceptable for these populations.

After per test was done, data collectors started to collect data and they carefully controlled the redundancy of data by recording the interviewed study participants' medical record numbers to separate them from non-interviewed study participants. Then, at the end of each data collection day, the questionnaires were checked by the supervisor for completeness and the supervisor discussed with the data collectors.

### Procedure for Data Processing and Data Analysis

Data was coded, cleaned and explored to identify outliers, missing values and inconsistency. The coded data were checked for completeness and entered into EpiData V4.6.0.2, then exported into IBM SPSS statistics version

25 for analysis. In the descriptive analysis, the mean, standard deviation, frequency and percentages were calculated and kept by using table. For the purpose of analysis, dummy variables (for k categories, k-1 dummy variable) were created for categorical variables such as educational status, marital status, occupational status, treatment modality and number of complications. All linear assumptions like homogeneity of variances, normality, multicollinearity and linearity were checked in all domains and the assumptions were fulfilled.

Then, according to WHO HRQOL guideline, linear regression analysis model was performed to identify factors associated with HRQOL with respect to physical health domain, psychological health domain, social health domain and environmental health domain. Simple linear regression analysis was done for one dependent variable with one predictor variable for each independent variable, then transferred to multivariable linear regressions analysis at p-value <0.25 with 95% confidence interval. Next, multivariable linear regression analysis was done by using forward selection method and variables whose p-value less than 0.05 at 95% confidence interval with unstandardized B-coefficient of the predictor variables were declared the relationship of dependent variable with independent variables in the model. During multivariable linear regression the total variation of  $R^2$  explained the model for each domain (physical domain,  $R^2 = 42\%$ , psychological domain,  $R^2 = 38\%$ , social domain,  $R^2 = 34\%$  and environmental domain,  $R^2 = 29\%$ ).

### Ethical Consideration

Ethical clearance was obtained from ethical review committee of Wollo University, College of Health Sciences and Department of Adult health nursing. After ethical clearance was received, permission letter was taken from Dessie Comprehensive Specialized Hospital chief executive officer and verbal consent was taken from all study participants by data collectors. Verbal informed consent taken from study participants was approved by the Ethical Review Committee of Wollo University and that this study was conducted in accordance with the Declaration of Helsinki. The information sheet was read to all eligible study participants, in addition to this, all participants were informed of the purpose of the study project and that their participation would be on voluntary basis and also that the names of the participants were omitted from the questionnaire and medical record number was used to ensure the confidentiality of the participants.

## Results

### Socio-Demographic Characteristics of the Study Participants

From a total sample of 417 study participants, 409 participated in the study which gives a response rate of 98%. Among the total respondents 208 (51%) were females and the mean age of respondents was 48 (SD±8.47). More than half, 266 (65%), of the study participants were married. Two hundred seventy one (66.3%) of the study participants were self-employed. From all respondents, 276 (67%) were enrolled in community-based health insurance (Table 1).

### Clinical Characteristics

The median duration of diabetes was 7 years, more than half 272 (67%) of study participants have developed complications and 139 (34%) have two diabetic related chronic complications. The mean of body mass index and fasting blood sugar were 28.6 (SD±4.7) Kg/m<sup>2</sup> and 200 (SD ±75.7) mg/dl, respectively. From participants, 241 (59%) had developed comorbidity diseases. Out of the total participants, 257 (63%) were taking oral anti-diabetic medication followed by 142 (35%) who were taking both insulin and oral anti-diabetic medication. The mean of waist circumference was 94.6 (SD± 14) cm. From all, 286 (70%) experienced depression and more than half of participants, 286 (70%), experienced perceived social stigma (Table 2).

### HRQOL

The mean score of physical domain HRQOL was 48±6.7 (47–49) followed by the mean score of psychological domain HRQOL which was 52±4.2 (50–52.3). The mean score of social HRQOL was 49±4 (48–50) and the mean score of environmental domain HRQOL was 48.9±3.4 (48–50.4) (Table 3).

### Health Satisfaction and Self-Rating of HRQOL Study Participants

From the total study participants, 202 (49.4%) were poor in their self-rating quality of life, whereas 172 (42.1%) were dissatisfied in their general health perception (Table 4).

### Factors Associated with Physical HRQOL

The variables with p-value <0.25 were perceived social stigma, depression, educational level, marital status, occupation, number of complications, treatment regimens,

**Table 1** Socio-Demographic Characteristics of Type Two Diabetic Follow-Up Participants Attending DCSH, Dessie, Northeast Ethiopia from February to April 08, 2020 (n=409)

Variables	Category	Frequency (n)	Percentage (%)
Gender	Male	201	49
	Female	208	51
Residency	Urban	232	57
	Rural	177	43
Educational status	Cannot read and write	169	41
	Can read and write	75	18
	Primary school	29	7
	Secondary school	38	9
	College	63	16
	University education	35	9
Marital Status Occupation	Single	18	4
	Married	266	65
	Widowed	82	20
	Divorced	43	11
	Unemployed	1	0.2
	Private employed	17	4.2
	Governmental employed	93	22.7
	House wife	27	6.6
	Self-employed	271	66.3
Enrolment in CBHI	Yes	276	67
	No	133	33
Age (Mean ± SD) in years		48±8.47	
Monthly income (median with 50th IQR) in Ethiopian birr		3200	

**Abbreviations:** CBHI, community-based health insurance; IQR, inter quartile range; SD, standard deviation.

comorbidity, fast blood sugar, BMI, duration of DM, diabetic related chronic complication, gender, residency, age and monthly income.

Finally depression, age, perceived social stigma and self-employed were inversely related with physical health-related quality of life, whereas duration of diabetes in years had direct relationship with physical HRQOL.

As age increased by one year, patients physical HRQOL decreased by 0.031 factor keeping effect of other variables constant [−0.031, 95% CI (−0.050 to −0.013)].

Patients who experienced depression symptoms were on average 1.15 lower physical HRQOL as compared with

**Table 2** Clinical Characteristics of Type Two Diabetic Follow-Up Participants Attending DCSH, Dessie, Northeast Ethiopia from February to April 08, 2020 (n=409)

Variables	Category	Frequency (n)	Percentage (%)
Chronic diabetic complications	No	137	33
	Yes	272	67
Number of complications	One complication	98	24
	Two complications	139	34
	Two and more than two complications	35	8.6
Type of complication	Diabetic nephropathy	136	33
	Diabetic retinopathy	30	7.3
	Diabetic neuropathy	53	13
	Diabetic foot ulcer	43	11
	Diabetic heart disease	69	17
Treatment regimens	Diabetic hypertension	156	38
	Oral anti-diabetic medication only	257	63
	Insulin and Oral anti diabetic medication	142	35
	One following the dietary recommendation only	10	2
	Comorbidity disease	No	168
Type of comorbidity diseases	Yes	241	59
	Heart related disease	74	18
	Kidney disease	94	23
Depression	Hypertension	99	24
	Non-depressed	123	30
	Depressed	286	70
Perceived social stigma	Not stigmatized	123	33
	Stigmatized	286	70
Smoking status	No	405	99
	Yes	4	1
History of Alcohol	No	409	100
	Yes	0	0
FBS (mean ± SD) in mg/dl		200±75.7	
BMI (Mean ± SD) in Kg/m <sup>2</sup>		28.6±4.7	
Waist circumference (Mean± SD) in centimetres		94.6 ± 14	
Duration diabetes (Median with 50th IQR) in years		7	

**Abbreviations:** BMI, body mass index; FBS, fasting blood sugar; Kg/m<sup>2</sup>, kilogram per meter square; IQR, inter quartile range; mg/dl, milligram per deciliter, in type of complications total response exceeds “n” due to multiple response, SD: standard deviation.

those patients who are non-depressed, keeping effect of other variables constant [-1.15,95% CI (-1.593 to -0.705)].

Patients who experienced perceived social stigma were on average 0.6 lower physical HRQOL as compared with those patients who are non-experienced perceived social stigma keeping effect of other variables constant [-0.6,95% CI (-1.027 to -0.137)].

As duration of diabetic increased by one year, patients physical HRQOL increased by 0.034 factor keeping effect of other variables constant [0.034, 95% CI (0.004 to 0.065)].

Being self-employed was on average 0.4 lower physical HRQOL as compared with governmental employed keeping effect of other variables constant [-0.4,95% CI (-0.721 to -0.076)] (Table 5).

## Factors Associated with Psychological HRQOL

The variables which were entered into simple linear regression analysis and passed to multivariable linear regression analysis with p-value <0.25 were perceived social stigma, depression, educational level, marital status, occupation, number of complications, treatment regimens, comorbidity, fast blood sugar, duration of DM, diabetic related chronic complication, monthly income, age, residency and gender.

Then multivariable linear regression analysis was done by using forward selection method and were declared depression, age and insulin and oral anti-diabetic medication had inverse relationship with psychological health-related quality of life.

As age increased by one year, patients psychological HRQOL decreased by 0.012 factor keeping effect of other variables constant [-0.012, 95% CI (-0.023 to -0.001)].

Patients who experienced depression symptoms were on average 0.9 lower psychological HRQOL as compared with those patients who are non-depressed keeping effect of other variables constant [-0.9,95% CI (-1.087 to -0.658)].

Patients who are taking insulin and oral anti-diabetic medication were on average 0.22 lower psychological HRQOL as compared with those patients who are taking oral anti-diabetic medication only, keeping effect of other variables constant [-0.22,95% CI (-0.411 to -0.021)] (Table 6).

**Table 3** The Four Domains of HRQOL with Their Mean Score of Study Participants Attending DCSH, Dessie, Northeast Ethiopia from February to April 08, 2020 (n=409)

Type of Domains	Mean	Median	Minimum Score	Maximum Score	SD	95% CI	
						Lower Bound	Upper Bound
Physical	48	48	32	64	6.7	47	49
Psychological	52	50.6	45.3	64	4.2	50	52.3
Social	49	48	32	58.7	4	48	50
Environmental	48.9	50	42	58	3.4	48	50.4

**Abbreviations:** CI, confidence interval; SD, standard deviation.

**Table 4** Health Satisfaction and Self Rating of HRQOL Among Type Two Diabetic Participants Attending DCSH, Dessie, Northeast Ethiopia from February to April 08, 2020 (n=409)

Self-Rating of Quality of Life	N	%	Self-Reported Health Satisfaction	n	%
Very poor	97	23.7	Very dissatisfied	70	17.1
Poor	202	49.4	Dissatisfied	172	42.1
Neither poor nor good	102	24.9	Neither dissatisfied nor satisfied	148	36.2
Good	6	1.5	Satisfied	16	3.9
Very good	2	0.5	Very satisfied	3	0.7

## Factors Associated with Social HRQOL

The variables which were entered into simple linear regression analysis and passed to multivariable linear regression analysis with p-value <0.25 were perceived social stigma, depression, educational level, marital status, occupation, number of complications, treatment regimens, comorbidity, fast blood sugar, duration of DM, diabetic related chronic complication, monthly income and waist circumference.

Then multivariable linear regression analysis was done by using forward selection method; declared depression, widowed and two complications had inverse relationship with social HRQOL.

Patients who experienced depression symptoms were on average 0.5 lower social health-related quality of life as compared with those patients who are non-depressed keeping effect of other variables constant [-0.5,95% CI (-0.727 to -0.308)].

Being widowed was on average 0.3 lower social health-related quality of life as compared with single keeping effect of other variables constant [-0.3,95% CI (-0.526 to -0.059)].

Patients who have two complications symptoms were on average 0.23 lower social health quality of life as compared with those patients who have one complication keeping effect of other variables constant [-0.23,95% CI (-0.43 to -0.034)] (Table 7)

## Factors Associated with Environmental HRQOL

The variables which were entered into simple linear regression analysis and passed to multivariable linear regression analysis with p-value <0.25 were, perceived social stigma, depression, education level, occupation, treatment regimen, comorbidity, residency, gender, age, income, CBHI, diabetic related chronic complication, duration of DM and fasting blood sugar.

**Table 5** Multivariable Linear Regression on Factors Associated with Physical HRQOL in Type Two Diabetic Participants in DCSH, Dessie, Northeast Ethiopia from February to April 08, 2020 (n=409)

Variables	Unstandardized Coefficients		Standardized Coefficients	p-value	95% CI for B	
	Beta	Std. Error			Beta	Lower Bound
Depressed	-1.15	0.226	-0.314	<0.001	-1.593	-0.705
Age	-0.031	0.009	-0.157	0.001	-0.05	-0.013
Stigmatized	-0.6	0.226	-0.159	0.01	-1.027	-0.137
Duration of diabetic in years	0.034	0.015	0.107	0.027	0.004	0.065
Self-employed	-0.4	0.164	-0.112	0.015	-0.721	-0.076

**Abbreviation:** CI, confidence interval.

**Table 6** Multivariable Linear Regression on Factors Associated with Psychological HRQOL in Type Two Diabetic Participants in DCSH, Dessie, Northeast Ethiopia from February to April 08, 2020 (n=409)

Variables	Unstandardized Coefficients		Standardized Coefficients	p-value	95% CI for B	
	B	Std. Error	Beta		Lower Bound	Upper Bound
Depressed	-0.9	0.109	-0.384	<0.001	-1.087	-0.658
Insulin and oral anti diabetic medication	-0.22	0.099	-0.099	0.03	-0.411	-0.021
Age	-0.012	0.006	-0.097	0.039	-0.023	-0.001

Abbreviation: CI, confidence interval.

**Table 7** Multivariable Linear Regression on Factors Associated with Social HRQOL in Type Two Diabetic Participants in DCSH, Dessie, Northeast Ethiopia from February to April 08, 2020 (n=409)

Variables	Unstandardized Coefficients		Standardized Coefficients	p-value	95% CI for B	
	B	Std. Error	Beta		Upper Bound	Lower Bound
Depressed	-0.5	0.106	-0.24	<0.001	-0.727	-0.308
Widowed	-0.3	0.119	-0.119	0.014	-0.526	-0.059
Two complications	-0.23	0.101	-0.111	0.022	-0.43	-0.034

Abbreviation: CI, confidence interval.

Multivariable linear regression analysis was done by using forward selection method, and then declared university level of education had direct relationship on environmental domain health quality of life, whereas insulin and oral anti-diabetic medication had inverse relationship with environmental health quality of life.

Patients who have a university level of education were on average 0.4 higher perceived environmental HRQOL as compared with those patients who cannot read and write keeping effect of other variables constant [0.4,95% CI (0.081 to 0.662)].

Patients who are taking insulin and oral anti-diabetic medication were on average 0.2 lower environmental HRQOL as compared with those patients who are taking oral anti-diabetic medication only keeping effect of other variables constant [-0.2,95% CI (-0.342 to -0.001)] (Table 8).

## Discussion

According to this study the physical HRQOL mean score was 48. This finding was in line with studies conducted in Felegehiwot Referral Hospital and Mizan Tepi University Teaching Hospital of Ethiopia with the mean score of 48 ±20.4 and 49±18, respectively.<sup>11,15</sup> However, this finding was lower than studies conducted in India, Nepal and Iran with the mean score of 62±15, 51.46±8.7 and 64±26.6, respectively.<sup>21-23</sup> The difference might be due to socio-demographic factors, life style of individual participants, difference in diabetic control, inclusion criteria in India (≥1 year follow-up with age >30 years), in Nepal the tool used (D-39 items) and in Iran inclusion criteria (≥ 6 months follow-up) and tool used (SF-36 items).

The psychological HRQOL mean score was 52 (50–52.3). This finding was congruent with studies conducted in

**Table 8** Multivariable Linear Regression on Factors Associated with Environmental HRQOL in Type Two Diabetic Participants in DCSH, Dessie, Northeast Ethiopia from February to April 08, 2020 (N:409)

Variables	Unstandardized Coefficients		Standardized Coefficients	P-value	95% CI for B	
	B	Std. Error	Beta		Upper Bound	Lower Bound
University educational level	0.4	0.148	0.124	0.012	0.081	0.662
Insulin and oral anti diabetic medication	-0.2	0.087	-0.097	0.049	-0.342	-0.001

Abbreviation: CI, confidence interval.

Felegehiwot Referral Hospital and Nekemte Specialized Hospital of Ethiopia with the mean scores of  $52 \pm 16$  and  $51.77 \pm 16.72$ , respectively.<sup>24,29</sup> On the contrary, this finding is lower than studies conducted in Jimma Teaching Hospital and Mizan Tepi University Teaching Hospitals of Ethiopia with mean scores of  $58.2 \pm 14$  and  $53.5 \pm 19.8$ , respectively.<sup>17,19</sup> The difference might be due to more than half of study participants in this study being self-employed, the study participants fasting blood sugar showed poor diabetic control, difference in duration of DM diagnosis and difference of tool used and inclusion criteria (in Jimma teaching hospital of Ethiopia inclusion criteria  $\geq$  three months and tool used was SF-36 items). Similarly, this study's mean score was lower than studies conducted in India and Nepal with the mean score of  $61.84 \pm 14.04$  and  $54.3 \pm 7.76$ , respectively.<sup>11,15</sup> The discrepancy might be due to socio-demographic factors, difference in diabetic control and life style as well as inclusion criteria in India ( $\geq 1$  year and age  $>30$  years) and measurement tool in Nepal (D-39 items).

The social HRQOL mean score was 49. This finding was lower than studies conducted in Jimma Teaching Hospital, Felegehiwot Referral Hospital, Nekemte Specialized Hospital and Mizan Tepi Teaching Hospital of Ethiopia with mean scores of  $71 \pm 26$ ,  $57.8 \pm 14.8$ ,  $56 \pm 30$  and  $53.7 \pm 17.5$ , respectively.<sup>9,11,22</sup> Similarly, this study's mean score was lower than studies conducted in Iran, Nepal and India with mean scores of  $59.45 \pm 25$ ,  $56.3 \pm 12$  and  $54.9 \pm 18.3$ , respectively.<sup>21-23</sup> The discrepancy might be due to socio-demographic factors, social strength difference, life style, inclusion criteria in Iran ( $\geq 6$  months follow-up), in India ( $\geq$  one year follow-up with age  $>30$  years) and tool used in Iran and Nepal (SF-36 items and D-39 items respectively).

The environmental HRQOL mean score was 48.9 ( $-48-50.4$ ). This finding was similar with study conducted in Mizan Tepi Teaching Hospital with the mean score of  $49.7 \pm 16$  (11). On the contrary, this study was lower than study conducted in Felegehiwot Referral Hospital of Ethiopia with the mean score of  $52.3 \pm 13$  (15). Similarly, this study's result was lower than study conducted in India with mean score of  $63 \pm 12$  (23). The difference might be due to socio-demographic factor, life style, difference in diabetic control, accessibility of health facility, inclusion criteria in India ( $\geq$  one year follow-up with age  $>30$  years) and more than half of the participants in this study were self-employed.

A unit increase in age was inversely related with patients physical and psychological HRQOL. This study

finding had consistency with studies conducted in Jimma and Mizan Tepi Teaching Hospitals of Ethiopia, Addis Ababa public hospitals, Botswana, Mexico, India, Bangladesh, Nepal, Spain and Qatar.<sup>11,14,15,17-19,27,30</sup> This might be because of the biological alteration of the patients as they got older and older, increasing cell degeneration, decreasing the immunity system, decreasing muscular fitness, increasing muscular atrophy, increasing cognitive impairment and decreasing coping pain intensity as followed by limiting daily physical activities, lack of self-confidence, feeling of inferiority, lack of concentration, decreasing decision making capacity and developing low self-esteem, as well as being prone to physical disability and mental disorder.

Patients who experienced depression symptoms had lower physical, psychological and social HRQOL as compared with those who had not experienced depression symptoms. This finding was congruent with the current studies conducted in Jimma teaching hospital of Ethiopia, Mexico and China.<sup>17,21,30</sup> This might be due to the biological effect of depression. As the patients become depressed, they experience decreasing oxygen supply to the tissue, increasing insulin resistance, increasing the imbalance of dopamine effect in the brain as followed by loss of appetite, fatigue, change of sleeping pattern, loss of interest in physical activities, prone to suicidal ideation, increasing feeling of inferiority, decreasing decision making role in the community, increasing social isolation and increasing feeling of worthlessness. The finding of this study implied that those type two diabetic patients may develop multiple physical disabilities, mental disability and social health crisis.

Patients who experienced feelings of perceived social stigma had negatively affected physical HRQOL as compared with those not feeling perceived social stigma. The finding of the study was in line with the study conducted in Nekemte specialized hospital of Ethiopia.<sup>24</sup> This might be due to the biological effect of perceived social stigma on physical HRQOL. As the patients experienced perceived social stigma, they also had increasing cellular stress, metabolic imbalance and neurological impairment followed by a decreasing feeling of interest in daily physical activities and increasing dependency on others. The finding in this study suggests that type two diabetic patients may be prone to self-isolation from society, suicidal ideation and decreasing role of physical performance in society.

A unit increase in duration of diabetes was directly related with physical HRQOL. This study finding was contradicting with studies conducted in Felegehiwot referral hospital and Jimma teaching hospital of Ethiopia, Serbia and China.<sup>17,21,45</sup> The discrepancy might be due to study area, socio-demographic factors and difference in inclusion criteria. The finding in this study was consistent with diabetic self-care American Association guideline, which state that diabetic patients who have long duration follow-up had better experience in diabetic self-care practice, life style modification, adherence of medication and regular follow-up.<sup>36</sup>

Being self-employed was linked with lower physical HRQOL as compared with governmental employee. The finding of this study was in line with a study conducted in Addis Ababa public hospitals.<sup>18</sup> The possible explanation for this finding, when comparing self-employed with governmental employed, self-employed are less educated and may have less adherence for diabetic self-care practice and also they may not have time for regular follow-up. On the contrary, this study's finding contradicted with the study conducted in Felegehiwot referral hospital of Ethiopia. The discrepancy might be due to more than half of the participants being self-employed, inclusion criteria in Felegehiwot referral hospital of Ethiopia was greater than or equal to one year, difference in duration of DM diagnosis, life style and difference in diabetic control practice.

Patients who are taking insulin and oral anti diabetic medication treatment regimen had negatively affected psychological and environmental HRQOL as compared with those patients who are taking oral anti diabetic medication only. This study finding was consistent with studies conducted in China, Indonesia and Malaysia.<sup>21,22,42</sup> This might be the physiological side effect of insulin and oral anti diabetic medication. Taking insulin and oral anti diabetic medication may disturb the metabolic process of the body and developing brain cell toxicity followed by disturbing body image and headache. However, this study finding was inconsistent with a study conducted in Saudi. The difference might be due to sampling technique difference in Saudi (used purposive sampling), genetic variation for medication side effect, diabetic self-care practice difference may be interrupting regular medication intake and socio-demographic factors.

Being widowed had lower social HRQOL as compared with being single. This finding is similar with studies conducted in Felegehiwot referral hospital of Ethiopia and Botswana.<sup>27</sup> The possible explanation for the finding

is that being widowed may increase social isolation by the population, feeling lonely, and lack of confidence in the community, family health instability and economic crisis. Patients who have the presence of two complications had decreased social HRQOL as compared with those patients who have the presence of one complication. This study was in line with a study conducted in Mizan Tepi teaching hospital of Ethiopia.<sup>19</sup> This might be the biological effect of two complications on social HRQOL. Patients who had the presence of two complications had a chance to develop organ failure as well as dependency on others, increasing social isolation and feeling lonely.<sup>2</sup> Patients who were educated in university level had shown increased environmental HRQOL as compared with those patients who cannot read and write. This finding was consistent with studies conducted in Jimma teaching hospital of Ethiopia, Felegehiwot referral hospital of Ethiopia, Nekemte teaching hospital of Ethiopia, Belgium, Turkey and Indonesia.<sup>17,24,44</sup> The possible explanation of this finding is that patients who were educated in university level might have better social relationship with the community, adapted to the environment easily, might have planned recreational time, better understanding regarding behavioral risk factors and diabetic self-care practice.

## Strength of the Study

This study assessed HRQOL by WHO guideline quality of life with respect to physical health domain, psychological health domain, social health domain and environmental health separately.

## Limitation of the Study

Using face-to-face interview may lead to social desirability bias by over-estimating or under-estimating the result.

## Conclusion & Recommendation

### Conclusion

The mean score of health-related quality of life in physical health domain, psychological health domain, social health domain and environmental health domain was recorded nearly half score point out of a hundred.

Increment of age, having depression symptoms, having perceived social stigma and being self-employed are variables having negative association with physical health-related quality of life, whereas increment duration of

diabetes in years has positive association with physical health-related quality of life.

Increment of age, having depression symptoms and taking both insulin and oral anti diabetic medication are variables having negative association with psychological HRQOL.

Having experienced depression symptoms, having two complications and being widowed are variables with negative associations with social HRQOL.

Taking both insulin and oral anti diabetic medication is a variable with negative association with environment HRQOL, whereas university level of education has a positive association with environment health-related quality of life.

## Recommendation

### Health Policy Makers

The policy makers should strengthen collaboration between diabetic and psychiatric clinics to improve psychological and social health problems on HRQOL.

### Hospital Managers

The hospital should strengthen the psychotherapy counseling approach, especially for those type two diabetic patients who experienced depression and perceived social stigma to improve their HRQOL.

The hospital managers should use this finding as a baseline and strengthen continuous monitoring and evaluation of the treatment outcome and complications in type two diabetic patients to improve their HRQOL.

### For Health Professionals

The health professional should use a holistic approach (physical, social, environmental, and psychological) to management during follow-up, especially for those patients who have experienced depression, perceived social stigma, are widowed, developing complications, self-employed and aged patients to improve their HRQOL.

The health professional should design an educational program and offer to DM patients in order to understand diabetic self-care practice and to improve their HRQOL.

### For Researchers

Better to do qualitative research than quantitative research regarding HRQOL in order to get clear information about HRQOL.

### For the Community

The community should support type two diabetic patients with respect to physical, psychological, social and

environmental aspect, especially those who have developed complications, are widowed, self-employed, experienced perceived social stigma and experienced depression symptoms to improve their HRQOL.

## Abbreviations

ANC, ante natal care; ART, anti retro viral therapy; BMI, body mass index; CBHI, community-based health insurance; CI, confidence interval; D-39, diabetes-39; DCSH, Dessie Comprehensive Specialized Hospital; DM, diabetes mellitus; EQ-5D, European quality of life 5 domains; FBS, fasting blood sugar; HRQOL, health-related quality of life; IDF, International Diabetes Federation; IQR, inter quartile range; Kg/m<sup>2</sup>, kilogram per meter square; Mg/dL, milligram per deciliter; NCD, non- communicable disease; QOL, quality of life; SD, standard deviation; SF-36, short form health survey; WHOQOL, BREF-26 Items-World Health Organization Quality of Life Instruments.

## Data Sharing Statement

Data are available by contacting the corresponding author.

## Ethics Approval

Ethical approval was obtained from the Ethical Review Committee of Wollo University. Permission letter was received from Dessie Comprehensive Specialized Hospital.

## Consent for Publication

All the participants consented to publish the study in this journal

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## Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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## Disclosure

The authors declare they have no competing interests.

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