

Evaluation of Quality of Life in Type 2 Diabetes Mellitus Patients Using Quality of Life Instrument for Indian Diabetic Patients: A Cross-Sectional Study

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ABSTRACT

Background: Type 2 diabetes mellitus (T2DM) is a chronic metabolic disease with major impact on the quality of life (QoL) in terms of various domains such as social, physical, and mental well-being. **Aim:** This study aimed to study the factors determining the QoL in T2DM patients. **Materials and Methods:** A prospective, observational study was conducted in a tertiary care hospital for 6 months. Patients of age ≥ 18 years and diagnosed with T2DM for ≥ 6 months (with and without comorbidities) were enrolled for the study. The sociodemographic and clinical characteristics were noted in the self-designed pro forma. The QoL was assessed by the Marathi-translated version of QoL Instrument for Indian Diabetes Patients questionnaire of 34 items and 8 domains. The reliability was validated by Cronbach's alpha. The differences were analyzed by Mann-Whitney U-test and Kruskal-Wallis test. **Results:** Out of 153 T2DM patients, majority were elderly males with mean age of 61.23 ± 11.4 years, married (83%), lower-middle income (57%), urban (51.6%), primary education (46.4%), had diabetes for 5 years or less (42.5%), had positive family history of diabetes (32.6%), and were treated by intensive therapy mainly insulin (41.2%). Statistically significant ($P < 0.05$) association was found between different domains of QoL and family history, hypertension, body mass index, educational status, marital status, income status, treatment, and complications. The domains of diet satisfaction and general health with the least mean estimates of 7.70 ± 2.62 and 8.25 ± 3.08 , respectively, were predominantly affected. **Conclusion:** QoL is an important parameter in diabetes treatment modality. Different factors affected QoL in diabetics in our study. Further studies are definitely needed for better data generation at national level.

KEYWORDS: *Quality of Life Instrument for Indian Diabetes patients questionnaire, quality of life, type 2 diabetes mellitus*

INTRODUCTION

India is titled as the diabetes capital of the world, with an estimate of about 72.94 million diabetic patients in 2017.^[1] Every 5th diabetic in the world is an Indian^[2] and the rising trends are due to aging, obesity, physical inactivity, genetic predisposition, rural to urban migration, and family history.^[1-3] Every diabetic patient's life is unique and they feel psychologically overwhelmed by the numerous rules that the disease constrain them to follow. Therefore, assessing the quality of life (QoL) of patients is important due to the

fact that each individual has their own individualized perception on their physical, emotional, and social well-being, which includes a cognitive element satisfaction as well as emotional component happiness.

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There are various factors associated with both short-term and long-term diabetes management that enumerate to the QoL negatively or positively. The microvascular and macrovascular complications and longer duration of illness associated with the disease are the foremost important factors that affects the patient's QoL. The anthropometric factors such as body mass index (BMI) and sociodemographic factors such as age, gender, marital status, income status and educational status adherence to proper glycemetic management, and strictly advised diet and exercise routine may have significant positive or negative correlation.^[4] A declining QoL and depression can also strongly influence a patient's commitment toward controlling his disease.^[4] Most of the existing QoL questionnaires for diabetics have been developed in the Western population which are socially, culturally, and economically different from Indian participants. By considering all such aspects, we aimed to determine the QoL of Indian diabetics using QoL Instrument for Indian diabetes patients (QOLID).

MATERIALS AND METHODS

Setting and participants

A prospective, observational study was conducted for 6 months. A total of 153 participants diagnosed with type 2 diabetes mellitus (T2DM) for at least 6 months previously and were ≥ 18 years of age whoever admitted into the hospital were enrolled into the study. Gestational diabetes patients, those with mental disability, and those not willing to cooperate were excluded from the study.

Ethics

The study was approved by the Institutional Ethics Committee. Written informed consents were obtained from the study participants before the study.

Data collection procedure and instrument

Details regarding sociodemographics such as age, BMI, clinical profile, family history, and duration of diabetes were obtained from a self-pre-designed patients' pro forma. QOLID, a tool developed for the Indian diabetes patients comprising a set of 34 items representing the 8 domains (namely, role limitation due to the physical health, physical endurance, general health, treatment satisfaction, symptom frequency, financial worries, mental health, and diet satisfaction) was used to assess the QoL.^[5] Initially, a pilot study was conducted by providing translated Marathi version validated linguistically by experts ($n = 3$) among 12 patients as per the inclusion criteria. The pilot results were excluded in final results. The Cronbach's alpha was obtained to determine the internal consistency of QOLID instrument.^[6]

Statistical and data analysis

The data were entered and analyzed in Microsoft Excel 2007. The margin of error of was determined by the Raosoft calculator for the sample size.^[7] The quantitative variables were expressed as mean \pm standard deviation. The differences among groups were analyzed by Mann-Whitney U-test and Kruskal-Walis test ($P < 0.5$).^[8,9]

RESULTS

Sociodemographic and clinical characteristics of the study population

Out of the 153 T2DM patients, majority of the population were with mean age of 61.23 ± 11.41 years, 57.5% were elderly males, 17.6% were at an increased risk according to the Asian BMI cutoff,^[10] and 69.3% were predominantly on mixed diet. The majority of the respondents had only primary education (46.4%) or was illiterate (32.7%). Among the individuals, most of them were married (83%), 79% were from the urban areas, and 51.6% and 32% were from lower-middle or upper-middle income status families, respectively. The results obtained had a margin of error of 7.8% for the 153 patients, calculated by Raosoft calculator.^[7] The internal consistency for the instrument was found to be 0.73 (for 10 randomly selected patients).^[6]

The large population had diabetes for 5 years or less (42.5%) with 32.6% positive family history of diabetes. Of all patients, 6.5% were found to be smokers and tobacco chewers each and about 9.2% were alcohol consumers. Majority patients of the study population were treated by insulin (41.2%) or oral hypoglycemic agent (OHA) were combined (34.6%) to maintain their optimum glycemetic level [Table 1].

Table 2 summarizes that in most of the patients random blood sugar (RBS) level was obtained (268.21 ± 112.71), whereas in few patients, fasting blood sugar was also monitored (223.33 ± 96.63), and about 77 patients were determined with a mean hemoglobin A1c (HbA_{1c}) (%) value of 9.16 ± 2.45 . Furthermore, the study population had a mean systolic blood pressure of 139.12 ± 22.09 and diastolic blood pressure of 83.98 ± 11.4 .

Figure 1 lists the complications associated with T2DM patients. The most common macrovascular complication observed were cardiovascular complications (67.97%) and diabetic foot (4.57%) in microvascular-related complications.

Quality of life and its associated domains

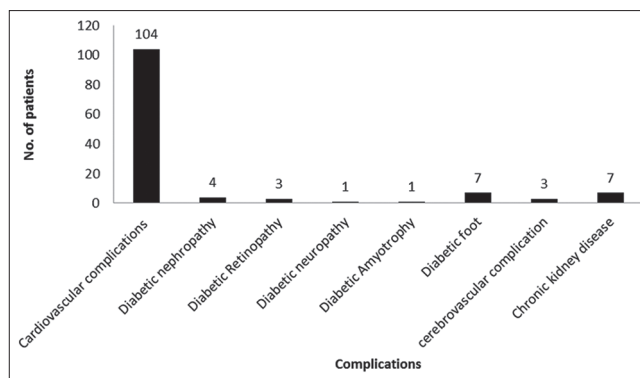
Table 3 indicates QoL based on 8 domains as represented. Overall mean score estimates of 4.4 and 4.12 determine higher QoL and minimal role limitation due to physical health and physical endurance, respectively. In domains

Table 1: Sociodemographic and clinical characteristics of the study population (n=153)

Characteristics	n (%)
Gender	
Male	88 (57.5)
Female	65 (42.5)
Age (years)	
<50	26 (16.1)
50-60	41 (26.8)
>60	86 (56.2)
BMI	
Underweight	14 (9.2)
Normal	112 (73.2)
Overweight	27 (17.6)
Diet	
Vegetarian	47 (30.7)
Mixed	106 (69.3)
Educational status	
Illiterate	50 (32.7)
Primary education	71 (46.4)
Higher secondary	19 (12.4)
Graduation	13 (8.5)
Marital status	
Single	0
Married	127 (83)
Widowed/divorced	26 (17)
Social habits	
Tobacco	10 (6.5)
Smoking	10 (6.5)
Alcohol consumption	15 (9.8)
Residential status	
Urban	121 (79)
Rural	32 (21)
Income status	
<3000	10 (6.5)
3001-10,000	79 (51.6)
100,001-30,000	49 (32)
300,001-50,000	12 (7.8)
>50,000	3 (2.0)
Diabetes family history	
Yes	50 (32.6)
No	103 (67.3)
Duration of diabetes (years)	
≤5	65 (42.5)
6-10	44 (28.8)
11-15	21 (13.7)
>15	23 (15)
Treatment	
Monotherapy OHA	27 (17.6)
Combination OHA	10 (6.5)
Insulin + OHA	53 (34.6)
Insulin	63 (41.2)

OHA: Oral hypoglycemic agent, BMI: Body mass index

of diet satisfaction, general health, and financial worries with lower mean estimates of 2.57, 2.75, and 2.83,

**Figure 1: Complications associated with type 2 diabetes mellitus**

respectively, predominantly affect the QoL of diabetic patients.

Differentials in quality of life

As shown in Table 4a, differences were observed between family history of diabetes and symptom botherness scores ($P = 0.0001$) and presence of hypertension and financial worries ($P \leq 0.0001$). As shown in Table 4b, following statistically differences were observed:

- BMI versus financial worries ($P = 0.0071$) and diet satisfaction ($P = 0.0157$)
- Educational status versus treatment satisfaction ($P = 0.0491$), general health ($P < 0.001$), financial worries ($P < 0.001$), emotional health ($P < 0.001$), and overall QoL ($P = 0.0004$)
- Marital status versus general health ($P = 0.0007$) and emotional health (0.0119)
- Income status versus financial worries ($P < 0.0001$)
- Treatment versus financial worries ($P = 0.0001$), diet satisfaction ($P = 0.0145$), and overall QoL ($P = 0.0192$)
- Complications versus symptom botherness ($P = 0.0069$) and overall QoL ($P < 0.001$).

The mean scores and standard deviation with respect to each domain were as shown in Table 5.

DISCUSSION

The QoL is gradually gaining importance with recent guidelines from the American Diabetes Association that emphasize on the need of “patient-centered” approach of the management of T2DM patients in terms of QoL, prevention of diabetic complications, and achievement of glycemic targets.^[11] However, there are very few articles available in respect to the Indian scenario. To the best of our knowledge, this is one of the rare studies conducted on Indian diabetics’ QoL. Furthermore, to the best of our knowledge, this is the first study in which Marathi version of the QOLID instrument has been used.

Correlation of significant parameters with various domains

Family history and symptom bothersness

We found a significant correlation observed in the domain of symptom bothersness and family history ($P < 0.005$) which is similar finding to the study conducted by Saleh *et al.*,^[12] patients with positive family history had higher mean QoL scores compared to those with no family history.

Body mass index and financial worries and diet satisfaction

Our findings indicate that overweight patients (BMI = 23–27.5 kg/m²), and underweight

patients (BMI ≤ 18.5 kg/m²) have lower mean QoL scores as compared to the normal patients. Patient's anthropometric measurement has significant correlation in the domains of financial worries and diet satisfaction ($P < 0.005$). There is increased risk of complications associated with increased BMI, which further causes the deterioration of physical well-being and thereby contribute to increased financial worries. Magnitudes in the correlation of BMI had negative impact on the T2DM patients QoL in many studies, and our study findings are consistent to other studies such as Akinci *et al.*^[13] and Redekop *et al.*^[14]

Education status and general health, treatment satisfaction, financial worries, and emotional health

The education status was the major sociodemographic variable associated with these 4 of the 8 QoL domains in our study. The mean scores of QoL is comparatively lower in the primary educated and illiterates as compared to the higher educated T2DM patients and significant variations due to education status is observed in the domains of general health, treatment satisfaction, financial worries, and emotional health ($P < 0.005$) which is consistent to the cross-sectional study conducted by Martinez *et al.*,^[15] in which education level was associated with 5 of the 6 QoL domains.

Table 2: Mean and standard deviation of the characteristics

Characteristics	Mean±SD
Age	61.23±11.41
Systolic blood pressure	139.12±22.09
Diastolic blood pressure	83.98±11.45
HbA1C (n=77)	9.16±2.45
RBS (n=118)	268.21±112.71
FBS (n=33)	223.33±96.63

HbA1C: Glycated hemoglobin, RBS: Random blood sugar, FBS: Fasting blood sugar, SD: Standard deviation

Table 3: Summary statistics on quality of life (n=153)

Domains	Items ^a	Mean ^b	SD	Minimum	Maximum
Role limitation due to physical health	6	26.40 (4.4)	4.88	6	30
Physical endurance	6	24.69 (4.12)	6.67	6	30
General health	3	8.25 (2.75)	3.08	3	15
Treatment satisfaction	4	13.75 (3.44)	10.67	4	20
Symptom bothersness	3	11.58 (3.86)	3.68	3	15
Financial worries	4	11.33 (2.83)	3.00	4	18
Emotional/mental health	5	18.52 (3.70)	3.42	7	25
Diet satisfaction	3	7.70 (2.57)	2.62	3	15

^aNumber of questions in a domain, ^bMean values based on summated and average scores. SD: Standard deviation

Table 4a: Comparison of independent variables with various domains

Independent variables	Scores*	Role limitation	Physical endurance	General health	Treatment satisfaction	Symptom bothersness	Financial worries	Emotional health	Diet satisfaction	Total QoL
Gender										
Male (88)	Z	-1.378	-0.05	1.738	-0.716	0.836	-0.0766	1.007	0.367	0.142
Female (65)	P	0.168	0.960	0.082	0.472	0.400	0.441	0.313	0.711	0.889
Residential status										
Urban (121)	Z	1.335	0.783	-0.967	0.141	0.283	0.455	-0.267	-1.166	0.565
Rural (32)	P	0.184	0.435	0.332	0.889	0.779	0.646	0.787	0.242	0.569
Family history										
Yes (50)	Z	0.103	-0.750	1.072	-2.011	-3.810	-0.875	-1.935	0.809	-1.435
No (103)	P	0.920	0.453	0.285	0.444	0.0001	0.378	0.052	0.418	0.149
Hypertension										
Yes (91)	Z	-0.504	1.137	0.321	0.961	0.273	-10.408	-0.204	-0.216	0.774
No (62)	P	0.617	0.254	0.749	0.337	0.787	<0.0001	0.841	0.826	0.441

*Calculated by Mann-Whitney U-test $P < 0.05$ significant. QoL: Quality of life

Table 4b: Comparison of independent variables with various domains (average rank)^a

Independent variables	n	Role limitation	Physical endurance	General health	Treatment satisfaction	Symptom botherness	Financial worries	Emotional health	Diet satisfaction	Total QoL
Age (years)										
<50	26	90	93.4	90.61	86.19	84.19	70.44	79.55	67.42	89.61
50-60	41	70.42	71.08	77.26	79.51	68.07	82.01	78.19	71.7	76.22
>60	86	76.20	74.84	72.75	73.02	79.08	76.59	75.65	82.38	73.56
χ^2		3.161	4.513	3.245	1.943	2.539	1.101	0.195	3.053	2.639
P*		0.2059	0.1047	0.1974	0.3784	0.281	0.5766	0.9069	0.2173	0.2673
BMI (kg/m ²)										
UW (<18.5)	14	69.85	65.25	62.60	57.46	59.75	46.11	60.39	104.68	56.71
N (18.5-23)	112	80.26	81.15	79.56	77	78.75	77.25	78.47	71.42	79.62
OW (23-27.5)	27	67.16	65.89	73.83	87.15	78.70	91.96	79.52	85.8	76.63
χ^2		2.301	3.663	1.989	4.137	2.335	9.887	2.177	8.303	3.329
P*		0.3165	0.1602	0.3698	0.1264	0.311	0.0071	0.3368	0.0157	0.1893
Education status										
Illiterate	50	86.46	79	54.89	67.95	76.26	61.38	46.23	70.04	63.07
Primary	71	67.65	71.29	83.02	76.43	74.73	72.95	87.99	82.44	74.91
secondary										
High secondary	19	88.08	93.55	112.58	101.32	81.53	107.24	105.63	80.87	112.05
Graduation	13	75.46	76.35	77.15	79.38	85.62	115	93.5	68.38	90.77
χ^2		6.64	3.934	26.009	7.856	0.89	25.213	38.209	2.941	18.24
P*		0.0843	0.2686	0	0.0491	0.8279	0	0	0.4008	0.0004
Marital status										
Single	0									
Married	127	76.56	77.69	81.37	77.78	77.95	77.58	81.07	79.77	79.79
Widow/ divorced	26	79.15	73.63	55.63	73.21	72.35	74.15	75.1	63.46	63.36
χ^2		0.074	0.181	7.282	0.229	0.346	0.129	6.32	2.924	2.966
P*		0.7856	0.6708	0.007	0.6323	0.5567	0.7192	0.0119	0.0873	0.0851
Social habits										
Smoking	10	17.95	17.2	15.8	17.7	19.7	19.85	17.65	17.2	18.55
Tobacco	10	17.4	19.4	23.05	22.65	14.8	12.95	20.2	16.55	18.2
Alcohol	15	18.43	17.6	16.1	15.1	19	20.13	16.76	19.5	17.5
χ^2		0.061	0.27	3.405	3.269	1.393	3.405	0.69	0.583	0.068
P*		0.9698	0.8735	0.1822	0.195	0.4982	0.1822	0.7082	0.7473	0.9664
Income status										
<3000	10	73.2	57.2	91	80.8	95.9	64.5	71.1	104.9	76.25
3001-10,000	79	73.5	74.2	78.1	72.1	74	62.3	75.8	76.8	71.42
10,001-30,000	49	89.1	88.4	72.4	82.7	80.9	87.9	74	73.3	84.79
30,001-50,000	12	57.2	71.3	72.9	79.3	74.4	125	87.6	76.6	81.96
>50,000	3	62.2	53.7	91.5	91.3	39.7	135.5	134.3	50.8	79.33
P*		0.138	0.1568	0.7358	0.7045	0.3173	<0.0001	0.1868	0.2532	NA
Duration of diabetes (years)										
≤5	65	83.55	84	86.14	78.19	78.43	75.2	81.9	74.58	83.42
6-10	44	79.59	74.38	70.88	79.71	70.63	77.06	74.21	72.81	74.66
11-15	21	74.85	71.59	67.30	76.30	86.06	69.30	68.76	80.64	74.14
>15	23	55.60	60.5	71.69	69.06	76.80	88.97	76	88.5	65.93
χ^2		6.974	5.965	4.941	0.955	1.861	2.421	1.706	2.276	3.01
P*		0.0727	0.1133	0.1762	0.8121	0.6017	0.4898	0.6356	0.5171	0.3901
Treatment										
Monotherapy	27	86.18	86.05	82.85	85.25	83.35	101.31	92.57	61.01	92.41
Combination	10	67	74.65	88.7	89.5	78	113.05	85.85	109.65	100.8
Insulin + OHA	53	79.32	74.66	78.26	82.08	82.85	72.73	73.98	83.49	77.55
Insulin		63	72.69	75.45	71.57	67.19	69.19	64.44	71.46	73.20

Contd...

Table 4b: Contd...

Independent variables	<i>n</i>	Role limitation	Physical endurance	General health	Treatment satisfaction	Symptom bothersness	Financial worries	Emotional health	Diet satisfaction	Total QoL
χ^2		2.409	1.397	2.157	5.514	3.443	20.297	4.965	10.54	9.928
<i>P</i> *		0.4921	0.7104	0.5405	0.1378	0.3282	0.0001	0.1744	0.0145	0.0192
Complications										
Microvascular	15	64.2	66.23	79.66	66.5	3.83	60.93	84.13	74.4	82.8
Macrovascular	41	73.03	80.03	77.79	68.10	94.08	86.20	70.01	74.59	109.84
No	97	80.65	77.38	76.25	82.38	72.84	75.59	78.85	78.41	62.22
χ^2		2.231	1.085	0.095	3.923	9.953	3.84	1.578	0.271	33.568
<i>P</i> *		0.3264	0.5812	0.9536	0.1406	0.0069	0.1466	0.4544	0.8731	0.0000

*Calculated by Kruskal-Walis test $P < 0.05$ are significant. Assessment is based on summated scores in the various domains. ^aAverage rank is quotient of "Rank Sum" by number of observations in a group. BMI: Body mass index, OHA: Oral hypoglycemic agent, UW: Underweight, N: Normal, OW: Overweight, NA: Not available

Nyanzi *et al.*^[16] study in Ugandan perspective also showed similar association of lower education level with detrimental QoL. Although there are contradictory results about this relationship, diabetic patients with higher education have positive self-esteem, better knowledge, and understanding of the disease, its treatment, and complications.^[17]

Marital status and general health and emotional health

In the present study, we observed that lower QoL was related to widowed or divorced patients than married people with higher QoL. There was a significant correlation of marital status in the domains of general health and emotional or mental health ($P < 0.05$) and our study findings were in parallel with studies conducted by Papazafropoulou *et al.*^[18] and Yildiz *et al.*^[19]

Income status and financial worries

In this study, income also played a significant role in QoL which was in accordance to cross-sectional study conducted by Saleh *et al.*^[12] The association between quality of life and financial aspect have been studied in articles like Nagpal *et al.*,^[5] Varghese *et al.*,^[17] Papazafropoulou *et al.*,^[18] Yildiz *et al.*,^[19] Shim *et al.*,^[20] Didarloo *et al.*,^[21] Praveen Kumar *et al.*,^[22] Sandhya Rani *et al.*,^[23] and Johnson *et al.*^[24] The income status of the patient contributes to financial worries ($P < 0.05$) as the majority population in our study were treated with either insulin (41.2%) or insulin with combination of OHA (34.6%) which have synergistic effect on the economic burden of the lower economic class.

Diabetic therapy and with financial worries and diet satisfaction

Our findings indicate that the T2DM patients who received more intensive therapy with insulin or insulin combination with OHA were associated with more impaired QoL in most of the domains as compared to patients who received less intensive therapy with OHA monotherapy or combination of one or more

OHA, which is parallel to the findings conducted by Huang *et al.*^[25] and Johnson *et al.*^[24] The diabetic treatment had significant correlation with domains of financial worries and diet satisfaction (< 0.05). Treatment was found to be statistically associated with diet satisfaction ($P = 0.0145$) in our study, but this finding was contradictory to the Sandhya Rani *et al.*^[23] study where mean QoL scores of dietary satisfaction in allopathic treatment were comparatively higher as compared to herbal medicines.

Complications correlation with symptom bothersness

In this study, diabetes-associated complications played a significant role in health-related QoL by significant effect on symptom bothersness, which was similar to the studies conducted by Redekop *et al.*,^[14] wherein the presence of diabetes-related complications have contributed to lower QoL. The reason is considered to be diabetes patient being an elderly is in higher incidence to get various complications and multiple organs get affected which contribute to various related symptoms. The overall QoL is thus determined as an additive of both the complications associated and diabetes-related bothersness which is found to be further decreased on determination.

Variables and its domains with noncorrelation

In this study, there was no correlation associated with any variables in the domains of the role limitation due to physical health and physical endurance. This finding was inconsistent to that of the cross-sectional studies conducted in Japan,^[26] Bangladesh,^[12] Korea,^[27] and Singapore^[20] where there was significant association of mobility and self-care in determination of QoL in T2DM patients. Despite the results of number of previous studies,^[16,18,28-31] no significant association between age, social habits, duration of diabetes, and complications with QoL was found; the reason to which is diabetic patients get adapted to the fact of disease and its associated complication. The study findings are similar to the study conducted in Greece^[18] except

Table 5: Mean of quality of life scores and standard deviation of independent variables in various domains

Independent variables	n	Role limitation	Physical endurance	General health	Treatment satisfaction	Symptom botherness	Financial worries	Emotional health	Diet satisfaction	Total Qol mean
Family history										
Yes	50	25.88±4.90	25.1±6.53	e8.64±3.07	13.98±4.26	11.32±3.64	11.68±2.10	19.14±3.37	7.57±2.6	123.28
No	103	26.65±4.88	24.48±6.67	8.07±3.08	12.47±10.67	11.71±3.68	11.15±3.00	18.21±3.42	7.78±3.62	120.29
BMI (kg/m ²)										
UW (<18.5)	14	26.35±4.74	23.42±6.37	7.14±3.03	11.14±11.41	10.21±3.79	9.14±2.93	17.64±3.31	9.21±2.41	114.28
N (18.5-23)	112	26.7±4.87	25.26±6.67	8.44±3.08	13.00±4.25	11.64±3.68	11.31±3.00	18.58±3.41	7.36±2.61	122.38
OW (23-27.5)	27	25.14±4.90	22.92±6.53	8.03±3.07	13.7±10.76	12.03±3.65	12.51±3.00	18.66±3.37	8.29±2.59	120.26
Education status										
Illiterate	50	27.42±4.87	25.28±6.67	6.8±3.08	12.1±4.25	11.86±3.68	10.4±3.00	16.22±3.41	7.38±2.61	116.98
Primary	71	25.46±4.91	23.5±6.53	8.6±3.07	12.85±10.88	11.3±3.68	10.94±2.87	19.43±3.35	7.97±2.58	120.10
High secondary	19	28.5±4.89	27.42±6.57	10.73±3.08	15.31±10.95	11.63±3.66	13.36±2.95	20.73±3.39	7.84±2.59	135.10
Graduation	13	25.15±4.91	24.84±6.44	8.3±3.09	13.38±11.43	11.92±3.77	14±2.96	19.07±3.40	7.23±2.53	123.92
Marital status										
Single	0									
Married	127	26.36±4.89	24.75±6.51	8.53±3.06	13.03±4.026	11.59±3.69	11.33±2.99	18.84±3.35	7.86±2.61	122.35
Widow/divorced	26	26.57±4.89	24.34±6.68	6.88±3.09	12.61±10.73	11.53±3.63	11.3±3.00	16.92±3.43	6.88±2.59	115.96
Income status										
<3000	10	27.4±5.63	22±7.38	9.2±3.03	13.5±4.59	13±3.62	10.2±2.94	18.5±3.10	9.2±2.25	123
3001-10,000	79	26.26±4.89	23.97±6.76	8.37±3.11	12.37±4.34	11.24±3.66	10.34±2.95	18.33±3.44	7.7±2.6	118.58
10,001-30,001	49	26.86±4.89	26.24±6.52	7.92±3.06	13.61±10.7	12.02±3.67	22.04±2.10	18.39±3.66	7.47±2.61	124.5
30,001-50,000	12	24.75±4.86	25.58±6.26	7.92±3.07	13.33±10.92	11.66±3.69	14.92±2.97	19.25±3.38	7.75±5.54	123.17
>50,000	3	25.67±2.93	23.33±4.43	9±2.64	14.67±3.19	8.33±4.02	15±2.19	22.67±7.63	6.33±2.45	125
Treatment										
Monotherapy	27	26.63±4.85	26.15±6.25	8.55±3.06	13.77±4.23	12.33±3.74	13.07±2.97	19.70±3.36	6.88±2.56	127.30
Combination	10	26.1±5.03	25.6±6.73	9±3.08	14.2±11.46	11.9±3.41	13.9±3.04	19±3.38	9.5±2.52	129.2
Insulin + OHA	53	26.4±4.88	24.69±6.67	8.25±3.08	13.75±10.67	11.58±3.68	11.33±3.00	18.52±3.42	7.7±2.62	121.68
Insulin	63	26.08±4.85	24.67±6.44	7.97±3.06	11.97±10.88	10.84±3.69	10.46±2.97	18.06±3.37	7.49±2.6	117.08

UW: Underweight, N: Normal, OW: Overweight, BMI: Body mass index, OHA: Oral hypoglycemic agent

there was no correlation with age parameter. Finally, we found weak association between quantitative variables such as glycemic control (HbA_{1c}, RBS) and QoL, a finding in agreement with number of other analyses, and in contrast to data reported by Somappa *et al.*^[32] who found that improved glycemic control was associated with impervious improvement in QoL.

Limitations

There were certain limitations to our study; first and foremost is the generalizability of the study is limited as the study site is a tertiary care hospital with small sample size and study conducted for shorter duration of period. Second, the time taken by the elderly to respond due to many associated factors also led to biasness. Finally, the scarcity of studies carried to assess the QoL in diabetic patients in Indian scenario; there were difficulties in comparing and interpreting the variables in our study population.

CONCLUSION

The current study is one of the fewer studies in India assessing QoL of diabetics' using an "Indian" instrument.

We found following parameters to have statistical association with different QoL domains – family history of diabetes, presence of hypertension, BMI, educational status, marital status, income status, treatment type, and complications. We recommend assessment of QoL as a part of diabetes treatment modality. Although this study provides interesting results in Indian patients, further QoL studies are needed in the country to better explore the area and helping policy-makers.

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Conflicts of interest

There are no conflicts of interest.

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