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ORIGINAL ARTICLE

Effect of Type 2 Diabetes Mellitus and Hypertension on Quality of Life: A Cross-Sectional Study

Simran Goel,[1] Sristi Anupam,[1] Karun Bhatti,[2] Dinesh Kumar Mehta,[1] Rina Das[1]

Abstract

Background/Aim: The quality of life (QOL) of the person is shown to be severely impacted by conditions such as type 2 diabetes mellitus (T2DM) and hypertension. Aim of this study was to investigate how both these conditions affect QOL of patients dealing with those conditions.

Methods: A total of 276 participants were divided into three groups: T2DM (45.00 %), hypertension (14.75 %) and both conditions (40.25 %). The analysis included monitoring blood pressure and blood sugar levels. Participants completed a health quality evaluation questionnaire and data were expressed as mean ± standard deviation.

Results: The results indicated that the duration of these diseases significantly impacted individuals' health. Physically, women were more adversely affected (12 %) than men (9.2 %) across all groups. Additionally, participants with mixed diets and both conditions experienced more negative effects (10.86 %) compared to vegetarians (6.25 %). It was found that individuals with T2DM and hypertension concurrently had a considerably lower QOL compared to those without these conditions.

Conclusions: The study highlights that the type of diet and the duration of the disease significantly influence the QOL of patients. These factors were found to have a substantial impact on the overall well-being of individuals with T2DM and hypertension.

Key words: Diabetes mellitus, type 2; Hypertension; Insulin resistance; Quality of life; Blood pressure; Blood glucose.

1. M.M. College of Pharmacy, Maharishi Markandeshwar (Deemed to be) University, Mullana, Ambala, HR, India.
2. Department of Medicine, M.M. Institute of Medical Sciences and Research, Maharishi Markandeshwar (Deemed to be) University, Mullana, Ambala, HR, India.

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Corresponding author:
RINA DAS
E: rinammu@gmail.com

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Introduction

According to the World Health Organization (WHO), health encompasses not only the absence of illness and infirmity but also the presence of physical, mental and social well-being.[1] Health-related quality of life (HRQOL) is clinically defined as "the functional effect of an illness and its subsequent therapy upon a patient, as perceived by the patient".[2] Managing chronic conditions often poses significant daily challenges for patients.[3] Type 2 diabetes mellitus (T2DM) is a complex metabolic disorder with multiple interrelated factors. Insulin therapy for T2DM can significantly impact the quality of life (QOL), either positively or negatively, depending on its effect on symptoms of hyperglycaemia or hypoglycaemia.[4] This condition is shown to severely affect the QOL of individuals. Beyond altering physiological processes, T2DM also contributes to various associated disorders, leading to numerous psychological issues.[5] The short-term impact of glycaemic control on QOL remains contentious. Multiple studies using various metrics, such as the SF-36, have shown limited evidence of a direct correlation between glycaemic management and HRQOL.[6–11] It is well recognised that diabetes-related complications, such as

peripheral neuropathy, coronary artery disease and peripheral vascular disease, significantly reduce HRQOL.[12–15] Hypertension is a common comorbidity of T2DM that further burdens QOL.[16] Individuals aware of their high blood pressure generally report lower QOL in terms of general health, physical functioning, energy levels and mental health compared to those unaware of their condition.[17] Although hypertension is often considered asymptomatic, it is associated with poor HRQOL due to comorbidities, complications, awareness of the diagnosis and side effects from antihypertensive medications.[18]

This study investigated the impact of concurrent T2DM and hypertension on patients' QOL. By analysing various health parameters and utilising the SF-36 questionnaire, the research aimed to understand how these comorbid conditions affect physical and psychological well-being and provide insights into the significant challenges faced by individuals managing both T2DM and hypertension.

Methods

Study participants

A total of 276 patients, aged 18 to 60, participated in this six-month observational study at a tertiary care hospital in India. The study population included individuals with T2DM (42 %), hypertension (14.75 %) and those with both conditions (40.25 %). Demographic information was collected after participants signed consent forms. Patients were screened according to inclusion and non-inclusion/exclusion criteria. Included were males and females aged 18-60 years. Diabetic, hypertensive individuals and patients having both T2DM and hypertension were included in this study. The likelihood of comorbid conditions increases in individuals over 60 years of age, leading to a corresponding rise in the number of medications used for treatment. Therefore, patients over the age of 60 were excluded from this study. Excluded were those with comorbid conditions (such as obesity, dyslipidaemia, cardiovascular diseases, chronic kidney disease, chronic liver disease, cancer), pregnant and lactating women and participants with a history of hepatotoxic drug intake, alcohol consumption, experiencing mental health complications or severe chronic or acute liver diseases.

The clinical protocol was approved by the Institutional Ethics Committee (Project Number: IEC-2341) and conducted in accordance with the Declaration of Helsinki and the Code of Good Clinical Practice. Informed consent was obtained from each participant, ensuring privacy and confidentiality. Standard treatment was not withheld from any patient during the study. This observational study was carried out at the Maharishi Markandeshwar Institute of Medical Science and Research (MMIMSR), Mullana, India after receiving ethical committee approval.

Assessment parameters

Height and weight of the participants were recorded to calculate BMI. As part of the research, fasting and random blood sugar levels (FBS & RBS) and glycated haemoglobin (A_1c) were measured for diabetic individuals.

Blood pressure was assessed using a calibrated sphygmomanometer, with the individual seated in a chair, feet flat on the floor and arms at heart level for at least five minutes prior to measurement. Both systolic and diastolic blood pressure readings were recorded.

Each patient completed the SF-36 questionnaire to assess their health-related QOL (HRQOL). The SF-36, originating from the Medical Outcomes Study, is a widely used tool for evaluating self-reported health outcomes.[19] It includes 36 questions covering eight different health categories.[20] This research specifically focused on two domains of the questionnaire: physical and psychological well-being.

The medical records of the hospitalised patients who met the study criteria were reviewed daily after receiving the informed consent. The data were collected from the general medicine department of MMIMSR. All necessary details of the patients, including drug therapy were collected and documented in the data collection form designed according to the needs of the study. Questions related to HRQOL were asked according to SF-36. The collected data were scrutinised and checked for completeness and clarity and were later analysed using Microsoft Excel.

Statistical analysis

The sample size was determined using the formula for estimating a single percentage [$n = (Z^2P(1-P)/m^2$], where Z is the standard normal variable at a 95 % confidence level (1.96), m indicated the margin of error, and p represented the expected 70 % prevalence of T2DM and hy-

pertension. A correction formula was applied to adjust the sample size. Descriptive statistics, including mean, frequencies and percentages, were used for categorical data analysis. Microsoft Excel was employed to calculate qualitative variables, which were expressed as frequencies (%).

Results

The demographic details of patients are presented in Table 1. The study included 110 patients with T2DM, of which 59 (53.6 %) were male and 51 (46.4 %) were female. As shown in Table 1, the male age group of 60-69 years has the highest number of patients (40.9 %). A 77.3 % of patients between the age group of 60-69 years were male followed by (22.7 %) in the age group 70-79 years age group.

According to RBS and HbA_1c data in Table 2, the age trend shows that T2DM affected 77.3 % (n = 85) of patients aged 60-69 years and 33.7 % (n = 25) of patients aged 70-79 years. Obesity was present in 21.9 % of the participants overall. T2DM became more prevalent as participants' BMI increased. The patients' mean BMI was found to be 24.31 ± 3.49 kg/m^2.

Table 3 data demonstrates that patients' QOL was impacted by the duration of their illness. Most afflicted patients (57.89 %) were those who have had both illnesses for more than 20 years. Of the 276 patients, 38.09 % of patients with T2DM and hypertension, 36.8 % of diabetic patients and 30 % of hypertensive patients indicated poor health.

Table 4 compares the overall health of the patients from a year ago in terms of gender, appetite, diet and smoking status for patients with diabetes, hypertension and both conditions together.

Table 5 demonstrates the effect of the disease on their daily work during 4 weeks. In each category more people have responded to yes for the given questions as their physical health was affected during 4 weeks.

Table 1: Demographic details and baseline characteristics

Variables	Diabetes (%)	Hypertension (%)	Both (%)
Diet			
Vegetarian	38.46	50.00	12.30
Mixed	45.89	67.00	21.91
Age (year)			
21-30	37.50	32.50	25.00
31-40	47.05	17.64	35.29
41-50	43.15	15.78	41.05
51-60	42.40	15.83	41.70
Appetite			
Normal	50.61	18.51	30.86
Reduced	40.00	16.92	43.07
Smoking status			
Smoker	46.57	34.00	12.32
Non smoker	40.38	83.00	19.70
Anthropometric parameters			
Weight (kg)	60.34	59.84	63.21
BMI (kg/m^2)	22.85	22.59	23.89

Table 2: Random blood sugar levels (RBS) and glycated haemoglobin (HbA_1c) data

Age (years)	RBS (> 140 mg/dL)	HbA_1c (> 5.7 %)	N (%)	Blood pressure (BP)	N (%)
21-30	5 (1.80 %)	Pre-diabetic	2 (0.72 %)	High systolic BP	5 (1.81 %)
		Diabetic	3 (1.08 %)	High diastolic BP	5 (1.81 %)
31-40	28 (10.14 %)	Pre-diabetic	8 (2.90 %)	High systolic BP	17 (6.15 %)
		Diabetic	20 (7.24 %)	High diastolic BP	17 (6.15 %)
41-50	79 (28.62 %)	Pre-diabetic	6 (2.17 %)	High systolic BP	60 (21.70 %)
		Diabetic	73 (26.44 %)	High diastolic BP	60 (21.70 %)
51-60	115 (41.16 %)	Pre-diabetic	4 (1.44 %)	High systolic BP	78 (28.26 %)
		Diabetic	111 (40.21 %)	High diastolic BP	78 (28.26 %)

Normal random blood glucose level (RBS): (80-130mg/dL); Normal HbA_1c: < 5.7 %, Pre-diabetic (5.7-6.4 %), Diabetic (≥ 6.5 %); Normal blood pressure (BP): systolic ≤ 139 mm Hg, Diastolic ≤ 89 mm Hg; High systolic BP, mm Hg (> 140 mm Hg), High diastolic BP, mm Hg (> 90 mm Hg);

Table 3: Comparison of general domains of quality of life in diabetic and hypertensive patients with duration of disease

Duration of disease (years)	Quality of life (QOL)				
	Poor	Fair	Good	Very good	Excellent
Diabetes (N = 125) (45.00 %)					
0-5 (N = 15)	2	2	5	4	2
6-10 (N = 23)	8	6	5	3	1
11-15 (N = 29)	12	8	6	3	0
16-20 (N = 42)	16	13	11	2	0
> 20 (N = 16)	8	7	1	0	0
Hypertension (N = 40) (14.75 %)					
0-5 (N = 4)	0	0	2	1	1
6-10 (N = 5)	0	1	3	1	0
11-15 (N = 11)	4	3	3	1	0
16-20 (N = 14)	5	4	4	1	0
> 20 (N = 6)	3	2	1	0	0
Both (N = 111) (40.25 %)					
0-5 (N = 11)	2	4	2	2	1
6-10 (N = 19)	7	5	4	3	0
11-15 (N = 27)	12	9	4	2	0
16-20 (N = 35)	17	14	3	1	0
> 20 (N = 19)	11	6	2	0	0

Table 4: Questions related to general health in patients with type 2 diabetes mellitus (T2DM), hypertension and both

Patients with	Questions	How would you compare your general health from one year ago?							
		Gender (n)		Diet (n)		Appetite (n)		Smoking status (n)	
		Male (43.11 %)	Female (56.89 %)	Veg (46.00 %)	Mixed (54.00 %)	Normal (30.07 %)	Reduced (69.92 %)	Smoker (27.89 %)	Non smoker (72.18 %)
T2DM	Much better now than one year ago	0	2	1	1	1	2	2	2
	Somewhat better now than one year ago	6	4	6	3	3	8	7	7
	About the same	10	7	8	6	8	8	8	10
	Somewhat worse now than one year ago	16	23	13	11	13	24	7	29
	Much worse than one year ago	23	25	17	29	16	33	10	34
Hypertension	Much better now than one year ago	1	1	0	2	2	2	1	2
	Somewhat better now than one year ago	2	3	1	5	2	3	2	3
	About the same	5	4	3	9	3	6	2	71

Hypertension	Somewhat worse now than one year ago	6	5	6	12	4	6	3	8
	Much worse than one year ago	13	9	10	13	5	17	4	19
Both	Much better now than one year ago	3	4	2	5	2	5	4	5
	Somewhat better now than one year ago	5	6	4	5	3	7	4	5
	About the same	9	12	13	14	3	14	5	14
	Somewhat worse now than one year ago	9	20	19	16	5	28	7	23
	Much worse than one year ago	11	32	25	17	13	30	11	31

Veg: vegetarian;

Table 5: Questions on physical health decline in 4 weeks

During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?										
Patients with	Questions		Gender		Diet		Appetite		Smoking status	
			Male (43.11 %)	Female (56.89 %)	Veg (46.00 %)	Mixed (54.00 %)	Normal (30.07 %)	Reduced (69.92 %)	Smoker (27.89 %)	Non smoker (72.18 %)
T2DM	Q1	Yes	13.04	13.04	10.50	15.57	7.60	18.47	16.66	9.42
		No	6.88	9.42	7.24	9.05	9.42	6.88	3.20	13.00
	Q2	Yes	10.50	15.21	10.50	15.21	8.33	17.39	6.52	19.20
		No	9.42	7.24	7.97	8.69	6.15	10.50	5.79	10.86
	Q3	Yes	9.79	14.13	10.14	13.76	7.94	15.94	5.07	18.84
		No	10.14	8.33	7.97	10.50	6.88	11.59	7.24	11.23
	Q4	Yes	9.05	13.76	9.78	13.04	6.88	15.94	5.79	17.02
		No	10.50	9.78	7.96	12.31	7.97	12.31	6.88	13.40
Hypertension	Q1	Yes	4.34	6.50	3.26	7.60	4.34	6.52	2.17	8.69
		No	3.62	2.89	2.89	4.34	1.08	5.43	1.44	5.07
	Q2	Yes	4.71	4.71	2.89	6.52	3.26	6.15	1.44	7.97
		No	3.62	4.34	3.26	4.71	2.17	5.79	1.81	6.15
	Q3	Yes	5.07	6.88	3.98	7.97	3.26	8.69	1.44	10.50
		No	2.89	2.89	1.81	3.98	1.81	3.98	1.81	3.98
	Q4	Yes	4.71	4.71	2.17	7.24	3.62	5.79	1.81	7.60
		No	3.26	4.34	3.62	3.90	1.81	5.79	1.08	6.52
Both	Q1	Yes	8.33	17.39	14.13	11.56	4.71	21.01	8.33	17.39
		No	5.07	9.42	9.05	5.43	5.07	9.42	2.53	11.95
	Q2	Yes	28.33	16.66	14.13	10.86	5.07	19.92	6.15	18.84
		No	5.43	9.78	7.97	7.24	4.71	10.5	4.71	10.50
	Q3	Yes	6.15	15.90	12.68	9.42	5.43	16.6	6.15	15.94
		No	7.24	10.50	10.50	7.24	4.34	13.4	4.71	13.04
	Q4	Yes	6.88	15.21	10.14	11.95	5.43	16.66	5.79	16.30
		No	6.88	10.86	7.24	10.50	3.98	13.76	5.07	12.68

Q1: Cut down the amount of time you spent on work or other activities; Q2: Accomplished less than you would like; Q3: Were limited in the kind of work or other activities; Q4: Had difficulty performing the work or other activities (for example, it took extra effort); Veg: vegetarian; T2DM: type 2 diabetes mellitus;

Discussion

The purpose of this study was to determine the impact of T2DM and hypertension in patients' HRQOL in order to gain a better understanding of their condition. People with T2DM and hypertension typically experience difficulties managing their everyday needs.[21] Insulin therapy for T2DM can have a significant impact on HRQOL, either favourably by decreasing symptoms of high blood sugar, for instance, or unfavourably by escalating symptoms of low blood sugar.[22] A total of 331 patients visited hospital during the studied period. Out of them 300 patients passed the inclusion criteria and were enrolled in the study. Amongst these 300 patients, 24 patients discontinued as they were not willing to participate. HRQOL detects how well the person is able to manage their daily lifestyle.

It was found that patient's QOL was impacted by the duration of their illness, as shown in Table 3. According to this study, individuals' health was most significantly influenced if they had these conditions for more than 20 years. The majority of affected individuals (57.89 %) had experienced both conditions for over 20 years. Thirty percent of the 276 patients had poor health and 38.09 % of the patients with T2DM and hypertension had the same condition. The data represented in Table 4 reflects the general health condition of patients as compared to one year ago. Majority of patients reported that their health condition worsened in one year. According to the data, female patients consuming mixed diet and did not smoke, had decreased appetites and typically reported being in worse condition than they were a year ago in all categories (T2DM, hypertension and both). The decline in health was especially noticeable in women, many of whom report feeling "much worse" or "somewhat worse." In the same way, patients who had inconsistent diets and decreased appetites tend to rate their health negatively more frequently. Compared to smokers, non-smokers reported worse health more often, suggesting that these variables have a big impact on patients' perceptions of their current and prior year's health. The information in Table 5 illustrates how these individuals' everyday routines were impacted by their physical condition. Females were more negatively impacted (12 %) than males (9.2 %) in each area in terms of their physical health. Diabetic and hypertensive patients with mixed diet were observed to be adversely affected (10.86 %) than vegetarians (6.25 %) however in category of both, patients who follow a vegetarian diet were highly impacted (12.83 %).

Study has some limitations. The age range for this study was restricted between the ages of 18 and 60 years. Additionally, excluded were comorbid diseases which may change the physiology of the disease. A further limitation of this study was the exclusion of lactating and pregnant women. Moreover, this study's sample size was modest; a bigger group of patients would provide more insight.

Conclusion

Health status and QOL were correlated with illness duration. The health situation gets worse the longer the ailment lasts. Patient's responses on questionnaires indicate that these conditions interfere with their ability to function normally in their day-to-day life. Majority of the patients suffering from T2DM and hypertension were considered to be in poor health state.

Ethics

The clinical protocol was approved by Institutional Ethics Committee (Project Number: IEC-2341) on 9 December 2022. Informed consent was acquired from each participant before conducting the interview while confidentiality and privacy was ensured.

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Conflicts of interest

The authors declare that there is no conflict of interest.

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Data access

The data that support the findings of this study are available from the corresponding author upon reasonable individual request.

Author ORCID numbers

Simran Goel (SG):
0009-0000-2557-6303
Sristi Anupam (SA):
0009-0004-0842-5836
Karun Bhatti (KB):
0009-0008-6617-7518
Dinesh Kumar Mehta (DKM):
0000-0003-4908-7437
Rina Das (RD):
0000-0002-2535-2729

Author contributions

Conceptualisation: RD
Methodology: SG, SA
Software: SA
Formal analysis: DKM, RD
Investigation: SG
Resources: RD
Data curation: SG
Writing - original draft: SA
Writing - review and editing: RD
Visualisation: DKM
Supervision: KB
Project administration: KB

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