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ASSESSING QUALITY OF LIFE IN TYPE II DIABETES PATIENTS WITH POLYPHARMACY - A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Diabetes mellitus significantly impacts patients' quality of life through multiple pathways including comorbidities, prolonged disease duration, and polypharmacy. This cross-sectional study assessed demographic patterns, healthcare access, and quality of life parameters among diabetic patients aged 31 to 80 years. **Methodology:** Data were collected from 324 individuals using structured questionnaires on demographics, comorbidities, medication usage, recent HbA1c levels, Quality of Life measures. Statistical analysis determined variations across age groups in healthcare access, satisfaction, physical functioning, and emotional well-being. **Conclusion:** Findings revealed that despite moderate healthcare access and frequent monitoring, HbA1c levels remained consistently elevated (>8%) across age groups. Comorbidities such as hypertension and neuropathy were prevalent. Younger individuals exhibited higher satisfaction with personal health, while older groups displayed stronger emotional resilience but faced greater physical limitations. Financial resources, information access, and healthcare services significantly influenced the perceived quality of life. Holistic, age-sensitive approaches focusing on emotional support, financial assistance, and tailored healthcare could improve long-term outcomes for diabetic patients.

KEYWORDS: Diabetes, Quality of Life, Comorbidities.

INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disorder characterized by elevated blood glucose levels resulting from impaired insulin secretion, insulin action, or both. It is among the most prevalent non-communicable diseases globally, affecting over 537 million people as of 2021, with projections indicating a continued upward trend. Diabetes is broadly categorized into type 1, type 2, and gestational diabetes, with type 2 diabetes mellitus (T2DM) accounting for approximately 90% of all cases. This condition is associated with significant morbidity, mortality, and healthcare costs due to its complications and associated comorbidities.[1]

➢ Relevance to the Study

The cross-sectional study titled *"*Quality of Life in type 2 diabetes patients with polypharmacy*"* aims to explore how Diabetes, particularly T2DM, impacts the overall well-being and quality of life (QoL) of individuals who are on multiple medications (polypharmacy). Since T2DM is typically associated with a multitude of complications ranging from cardiovascular diseases and nephropathy to neuropathy and retinopathy, it necessitates long-term pharmacological interventions. This inevitably raises the risk of polypharmacy, drug-drug interactions, and medication-related problems, which in turn can negatively influence the patients' quality of life. Therefore, understanding diabetes in its entirety - its pathophysiology, progression, and management is essential to interpreting how it affects patient's lived experiences.

➢ **Pathophysiology and Disease Mechanism**

The fundamental pathophysiology of diabetes, particularly T2DM, involves insulin resistance in peripheral tissues coupled with pancreatic β-cell dysfunction. In normal individuals, insulin facilitates the uptake of glucose into cells for energy production or storage. However, in T2DM, cells in muscles, fat, and the liver become resistant to insulin, forcing the pancreas to produce more insulin to overcome this resistance. Over time, the pancreatic β-cells become exhausted, leading to decreased insulin secretion and persistent hyperglycemia.

METHODOLOGY

Study Design

Cross-sectional questionnaire-based study conducted in a tertiary care hospital.

Study site

Shadan Institute of Medical Science, Teaching Hospital and Research Centre, Himayat Sagar Road, Hyderabad India.

Study Population

Patients diagnosed with Type 2 Diabetes Mellitus and receiving more than 5 medications continuously for at least 6 months.

Inclusion Criteria

- Age ≥ 30 years
- Diagnosed with T2DM for at least 1 year
- On polypharmacy (≥5 medications)
- Consent to participate

Exclusion Criteria

- Type 1 diabetic patients
- Patients with cognitive impairment or psychiatric illness
- Pregnant women

Sample Size

The sample size was calculated by using the **Cochran's formula**:

$$n = \frac{Z^2 \cdot p \cdot (1-p)}{d^2}$$

Where

- **n** = required sample size
- **Z** = Z-value (standard normal deviate) corresponding to 95% confidence level = **1.96**
- **p** = estimated prevalence of polypharmacy among T2DM patients (assume **50%** if unknown, for maximum sample size)
- **d** = margin of error (precision), typically **0.05 (5%)**

Calculation:

$$n = \frac{(1.96)^2 \cdot 0.5 \cdot (1-0.5)}{(0.05)^2} = \frac{3.8416 \cdot 0.25}{0.0025} = \frac{0.9604}{0.0025} = 384.16$$

$$\boxed{n \approx 384}$$

Therefore, 384 participants were included in the study

STATISTICAL ANALYSIS

Data were coded and analyzed using Microsoft Excel (Office 365). Descriptive statistics functions like AVERAGE [mean] was used to determine Diabetes Quality of Life (DQoL) and Medication Appropriateness Index (MAI) scores. DQoL domain responses (e.g., satisfaction, impact, worry, social) were numerically coded, with higher scores indicating poorer quality of life. Composite and total scores were calculated using Excel formulas. For MAI, each medication was rated based on standard criteria, and total scores were computed per patient. Pivot tables and charts were utilized to summarize data and identify trends visually.

QUESTIONNAIRE

The demographic parameters included in study were age, BMI, family history, fasting blood sugar, HbA1c and different comorbidities (Hypertension, Neuropathy, CKD, Dyslipidemia, Retinopathy and others).

The DQoL questionnaire is divided into 4 domains:

DOMAIN 1 – satisfaction

DOMAIN 2- impact

DOMAIN 3- worry

DOMAIN 4 -social/ emotional well being

Each domain consists of 5 questions and the results are based on the scores calculated by mean value.

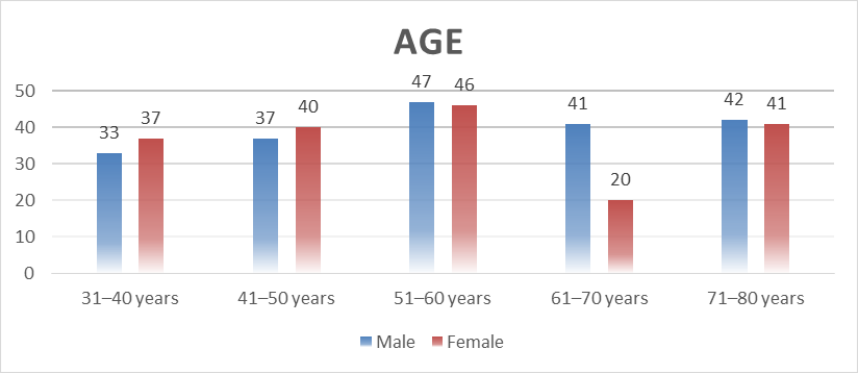
For polypharmacy MAI tool was used which is a validated tool that assesses medication appropriateness based on factors such as indication, effectiveness, dosage, directions, interactions, duplication, and cost.

RESULTS

SECTION A: SOCIO-DEMOGRAPHIC PROFILE OF THE PARTICIPANTS

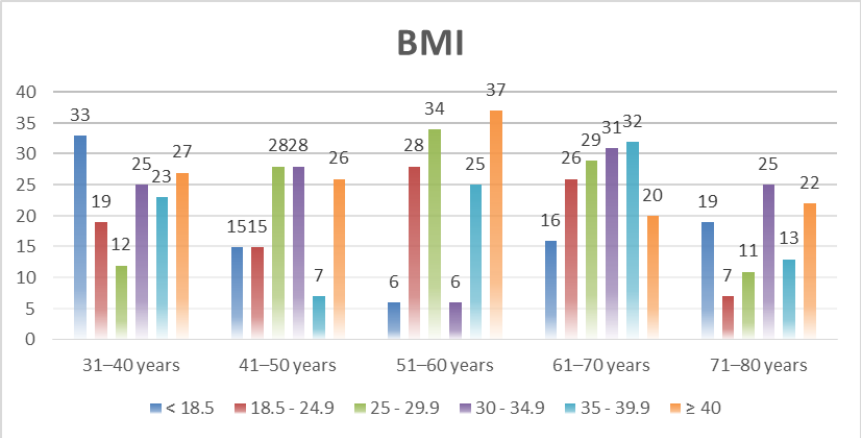
AGE WISE DISTRIBUTION

Age Group	Male	Female	Total
31–40 years	33	37	70
41–50 years	37	40	77
51–60 years	47	46	93
61–70 years	41	20	87
71–80 years	42	41	83
Total	**200**	**184**	**384**



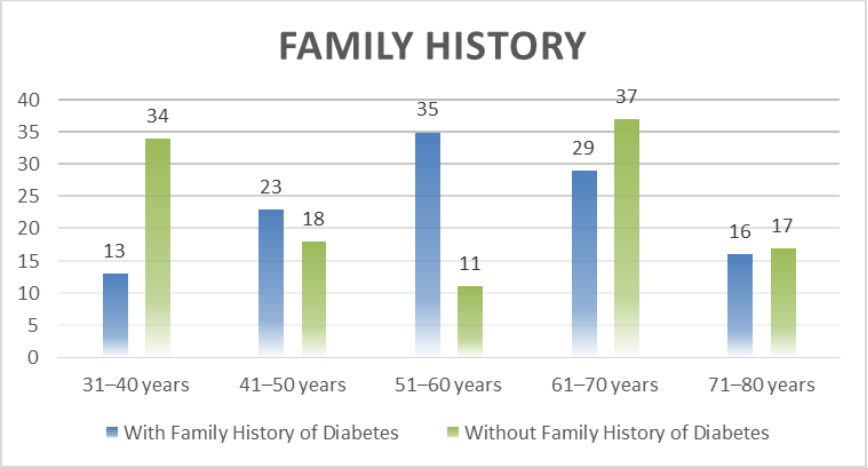
BMI Categories (Kg/m²) by Age Group

Age Group	< 18.5	18.5 - 24.9	25 - 29.9	30 - 34.9	35 - 39.9	≥ 40
31–40 years	33	19	12	25	23	27
41–50 years	15	15	28	28	7	26
51–60 years	6	28	34	6	25	37
61–70 years	16	26	29	31	32	20
71–80 years	19	7	11	25	13	22



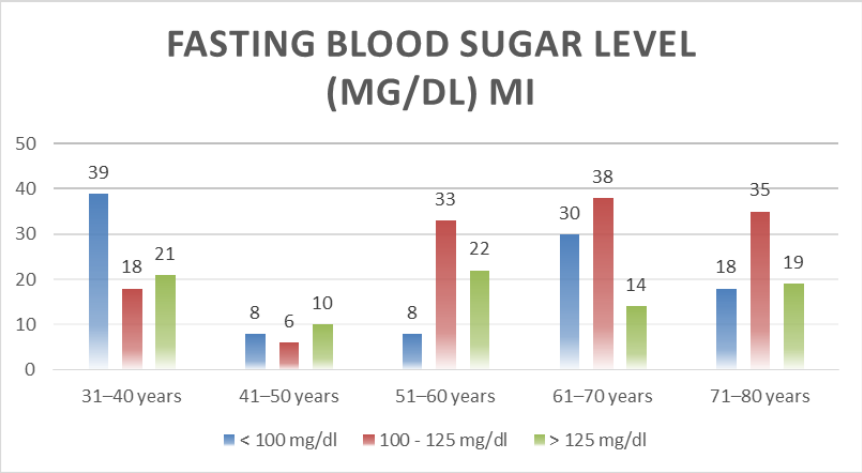
Family History of Diabetic by Age Group

Age Group	With Family History of Diabetes	Without Family History of Diabetes
31–40 years	13	34
41–50 years	23	18
51–60 years	35	11
61–70 years	29	37
71–80 years	16	17



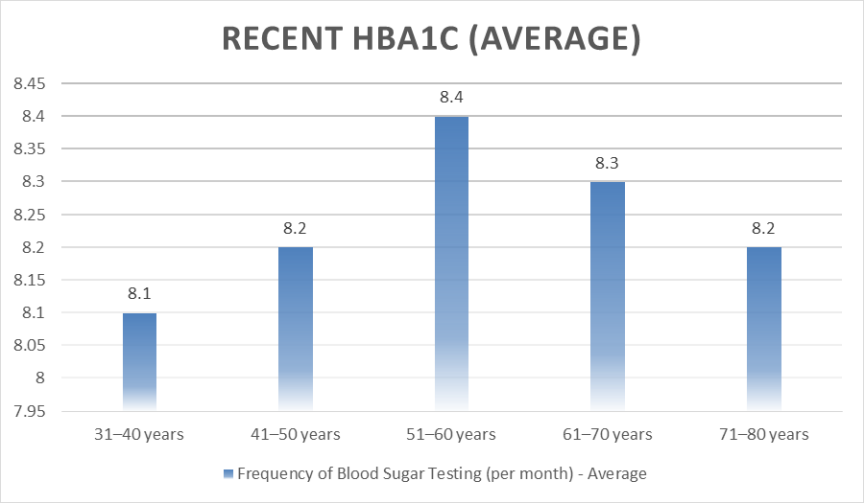
Fasting Blood Sugar Level (mg/dl) of participants

Age Group	< 100 mg/dl	100 - 125 mg/dl	> 125 mg/dl
31–40 years	39	18	21
41–50 years	8	6	10
51–60 years	8	33	22
61–70 years	30	38	14
71–80 years	18	35	19



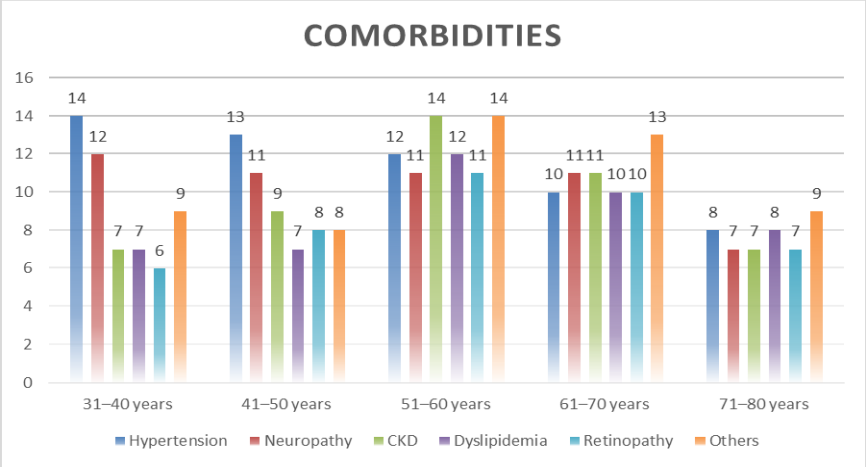
AVERAGE HbA1c LEVELS BY AGE GROUPS

Age Group	Recent HbA1c (Average)
31-40	8.1
41-50	8.2
51-60	8.4
61-70	8.3
71-80	8.2



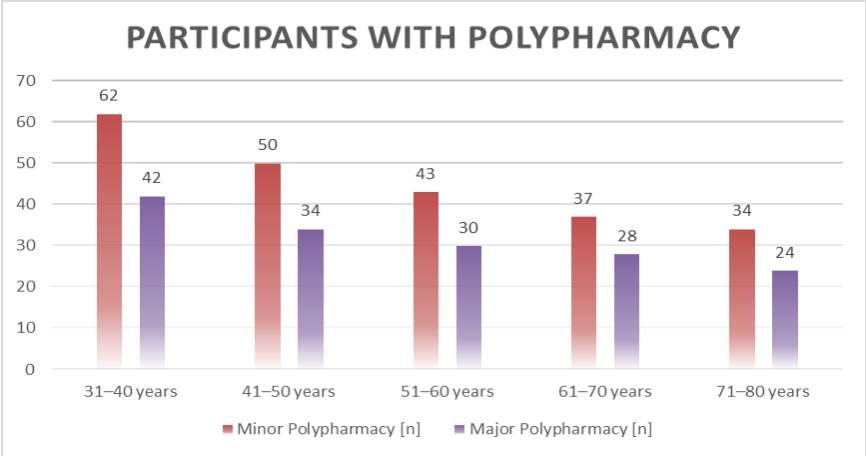
DIABETIC PATIENTS WITH COMORBIDITIES

Age Group	Hypertension	Neuropathy	CKD	Dyslipidemia	Retinopathy	Others
31–40 years	14	12	7	7	6	9
41–50 years	13	11	9	7	8	8
51–60 years	12	11	14	12	11	14
61–70 years	10	11	11	10	10	13
71–80 years	8	7	7	8	7	9
Total	57	41	48	44	42	53



Participants With Polypharmacy

Age Group	No. of participants	Minor Polypharmacy [n]	Major Polypharmacy [n]
31-40	104	62	42
41-50	84	50	34
51-60	73	43	30
61-70	65	37	28
71-80	58	34	24
TOTAL	**384**	**226**	**158**



Section B: Diabetes Quality of Life (DQOL)
(Scale: 1 = Very Satisfied, 5 = Very Dissatisfied)
Score = Mean

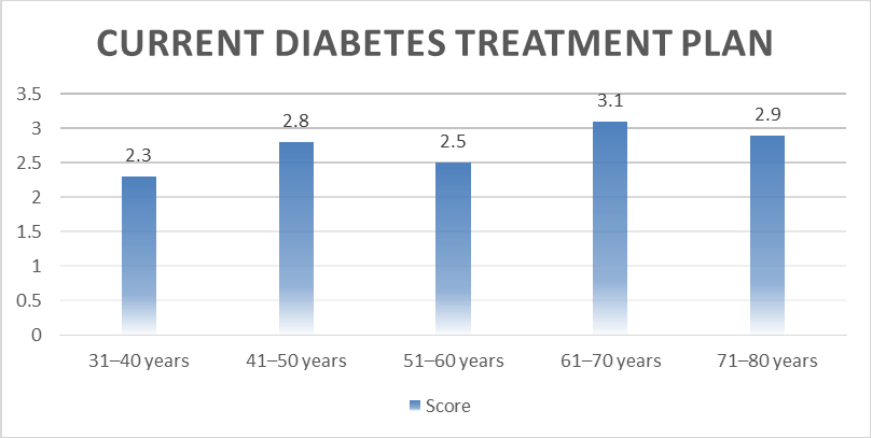
$$\text{Mean} = \bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$$

- Very satisfied
- Satisfied
- Neither satisfied nor dissatisfied
- Dissatisfied
- Very dissatisfied

Treatment Satisfaction (Domain 1)

1. How satisfied are you with your current diabetes treatment plan?

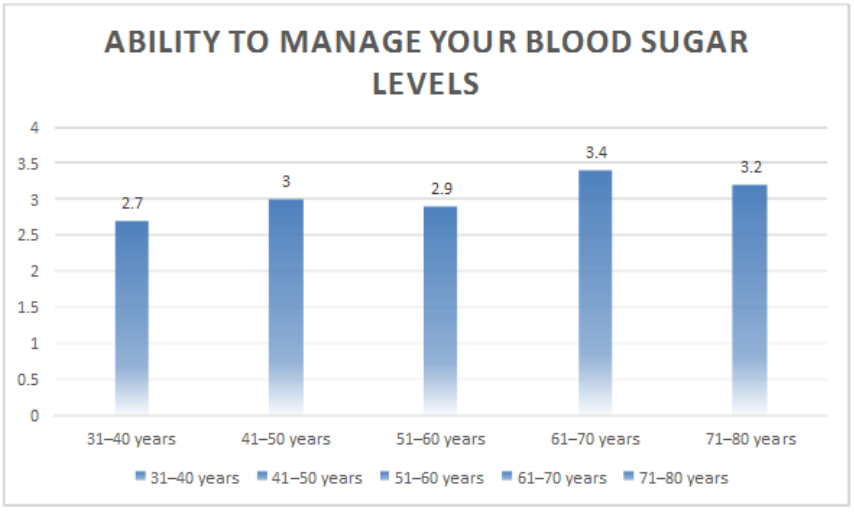
Age Group	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Score
31–40	**15**	**25**	**18**	**8**	**5**	**2.3**
41–50	**20**	**35**	**20**	**8**	**5**	**2.8**
51–60	**18**	**30**	**17**	**7**	**3**	**2.5**
61–70	**25**	**30**	**8**	**4**	**2**	**3.1**
71–80	**22**	**32**	**15**	**8**	**4**	**2.9**



Q2. How satisfied are you with your ability to manage your blood sugar levels?

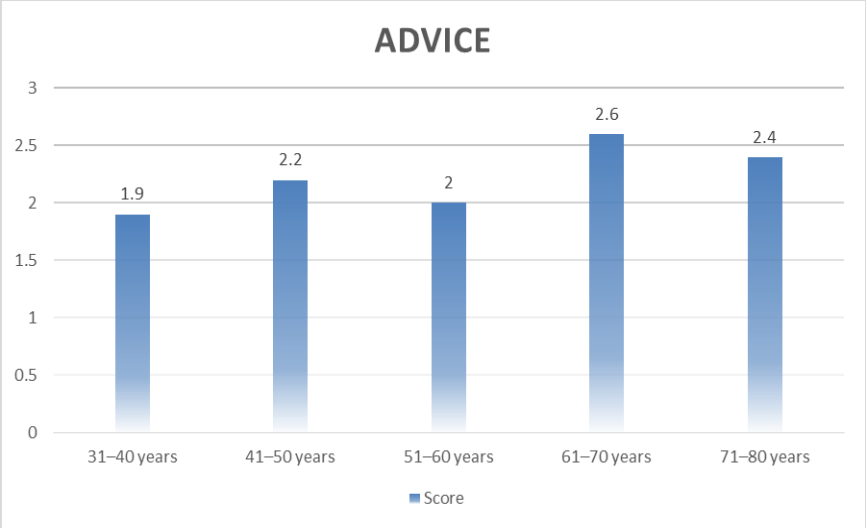
- Very satisfied
- Satisfied
- Neither satisfied nor dissatisfied
- Dissatisfied
- Very dissatisfied

Age Group	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Score
31–40	12	20	24	16	8	2.7
41–50	11	15	23	17	10	3
51–60	11	18	22	14	7	2.9
61–70	9	17	26	21	12	3.4
71–80	7	14	20	18	12	3.2



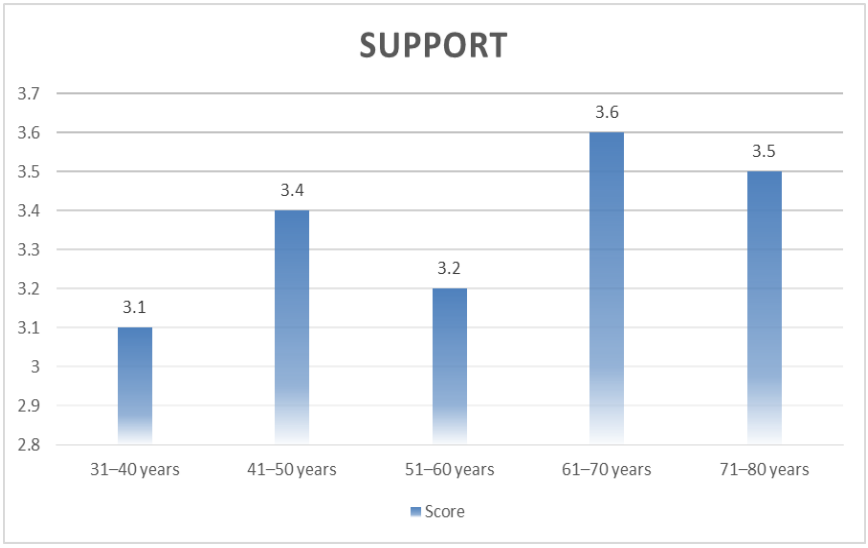
Q3. How satisfied are you with the support and advice you receive from your healthcare provider?

Age Group	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Score
31–40	11	18	25	17	9	1.9
41–50	10	15	24	16	11	2.2
51–60	9	17	26	14	8	2
61–70	8	16	28	20	10	2.6
71–80	6	14	24	18	10	2.4



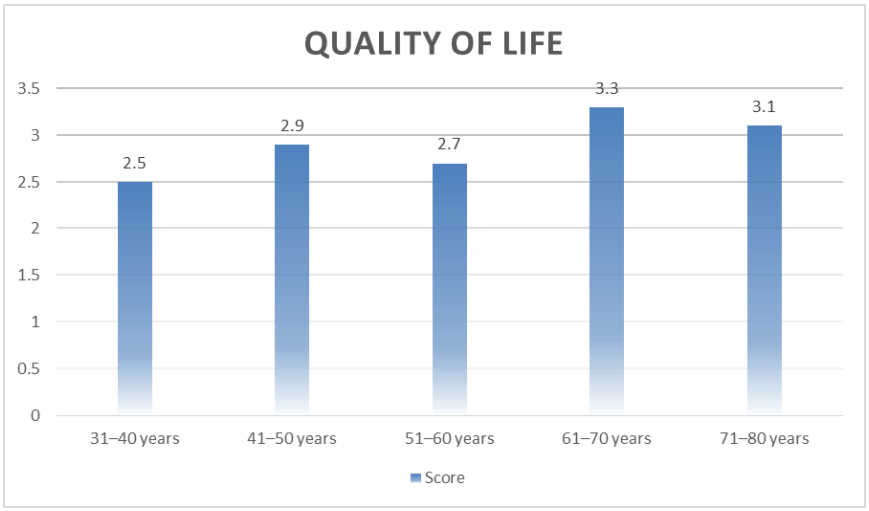
Q4. How satisfied are you with the result of dietary changes on your blood sugar control?

Age Group	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Score
31–40	10	19	24	18	9	3.1
41–50	9	17	26	15	10	3.4
51–60	9	18	25	14	8	3.2
61–70	7	16	28	20	10	3.6
71–80	6	15	24	19	10	3.5



Q5 How satisfied are you with your overall quality of life?
Impact of Diabetes on Daily Life (Domain 2)
(Scale: 1 = all the time, 5 = none of the time)

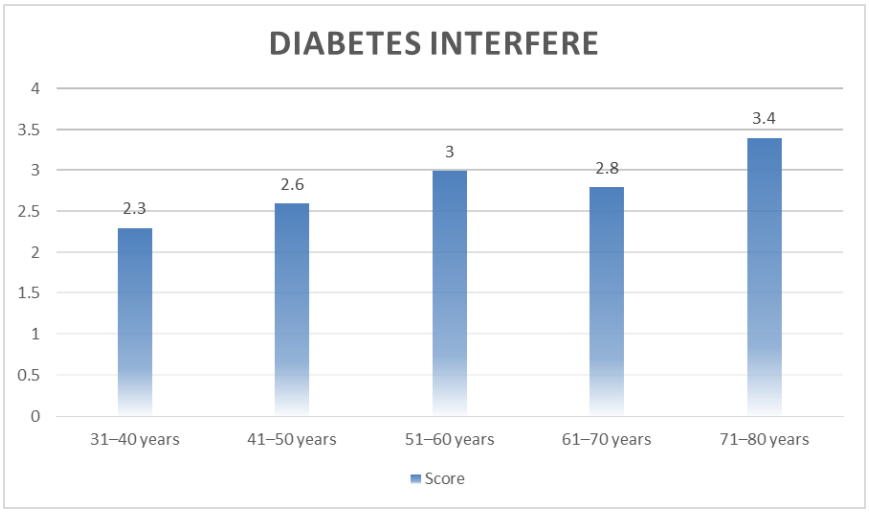
Age Group	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Score
31–40	12	20	23	17	8	2.5
41–50	10	16	25	16	9	2.9
51–60	9	17	26	14	8	2.7
61–70	8	15	27	20	10	3.3
71–80	6	14	23	18	11	3.1



Q6. How often does diabetes interfere with your work, school, or daily activities?

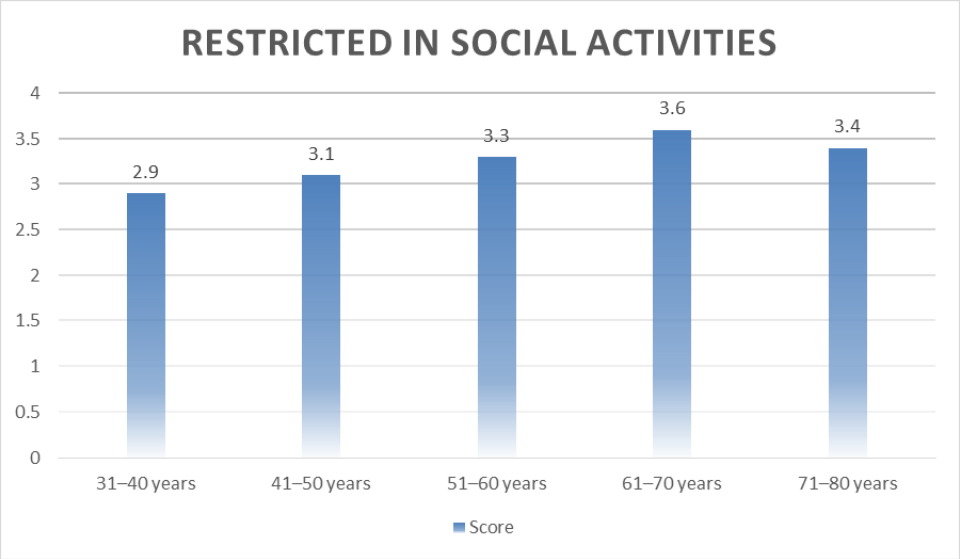
- All the time
- Most of the time
- Some of the time
- A little of the time
- None of the time

Age Group	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Score
31–40	11	19	24	18	8	2.3
41–50	10	17	25	15	10	2.6
51–60	9	18	26	13	8	3
61–70	8	16	27	20	10	2.8
71–80	7	15	24	19	10	3.4



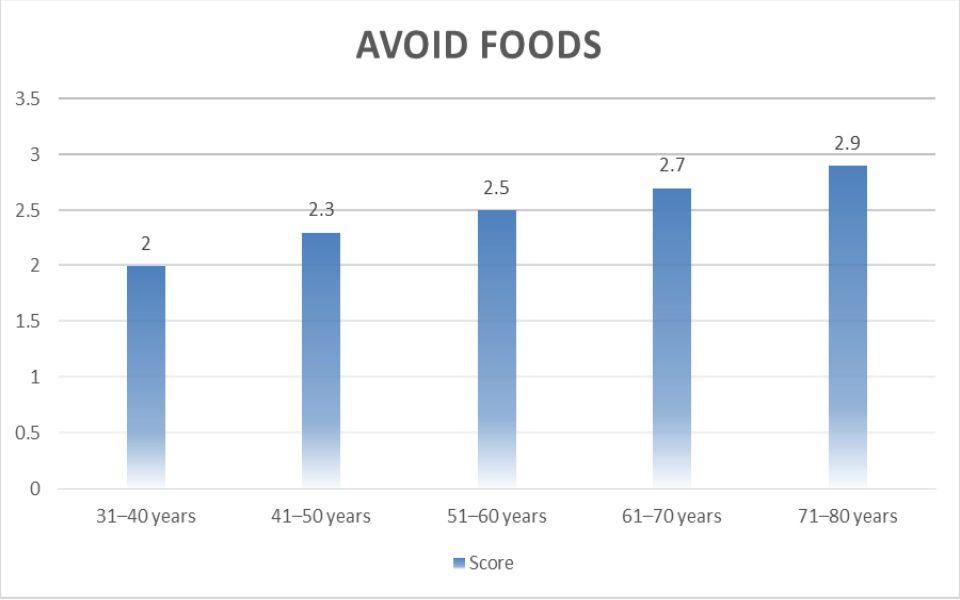
Q7. How often do you feel restricted in social activities because of diabetes?

Age Group	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Score
31–40	10	18	25	19	8	2.9
41–50	9	16	26	16	9	3.1
51–60	9	17	25	14	8	3.3
61–70	7	15	28	21	9	3.6
71–80	6	14	23	19	10	3.4



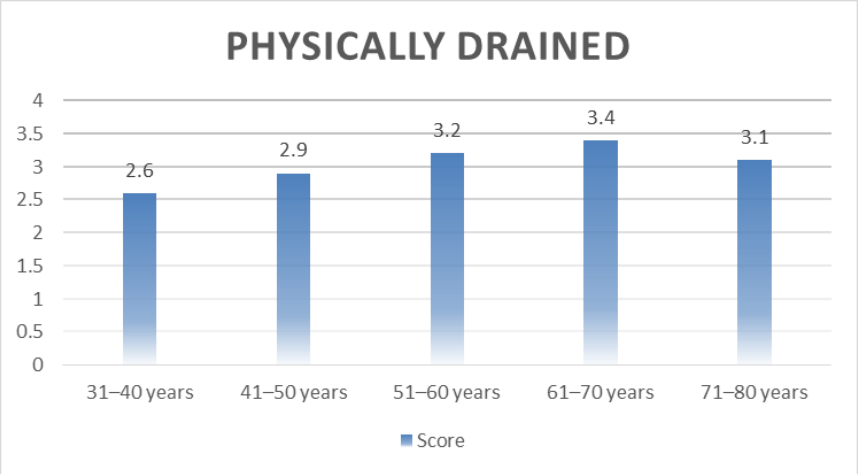
Q8. How often do you avoid certain foods due to your diabetes?

Age Group	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Score
31–40	12	21	23	17	7	2
41–50	11	17	25	15	8	2.3
51–60	10	18	26	13	7	2.5
61–70	8	17	28	20	7	2.7
71–80	7	15	24	19	9	2.9



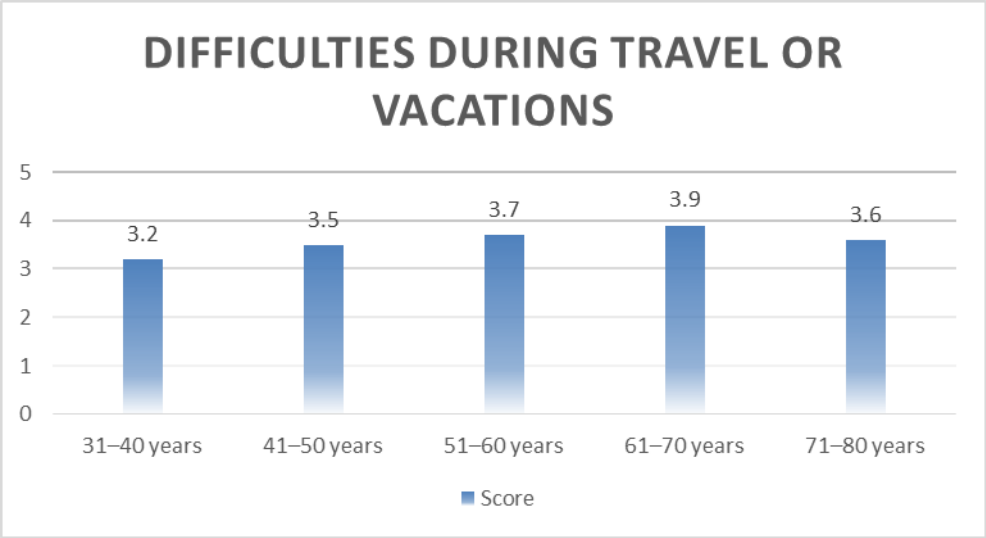
Q9. How often do you feel physically drained or fatigued because of diabetes?

Age Group	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Score
31–40	11	19	24	18	8	2.6
41–50	10	16	25	16	9	2.9
51–60	9	18	26	14	7	3.2
61–70	8	15	27	21	8	3.4
71–80	6	14	24	19	9	3.1



Q10. How often do you experience difficulties managing your diabetes during travel or vacations?

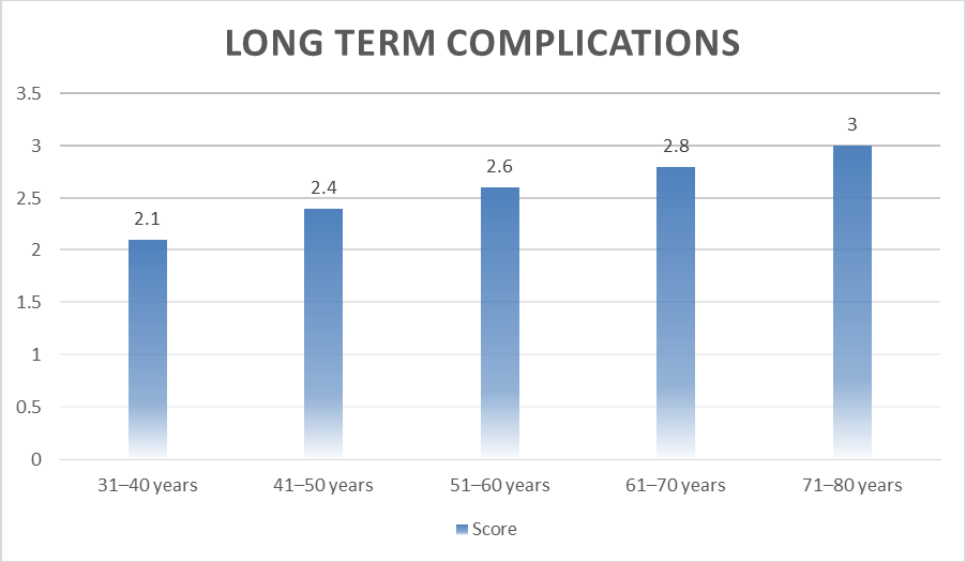
Age Group	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Score
31–40	10	18	24	19	9	3.2
41–50	9	15	25	17	9	3.5
51–60	9	17	26	14	8	3.7
61–70	7	15	28	21	9	3.9
71–80	6	14	24	20	10	3.6



3. Worry About Diabetes and Health (Domain 3)
(Scale: 1 = all the time 5 = none of the time)
Q11. How often do you worry about long term complications related to diabetes (e.g., kidney disease, vision problems, neuropathy)?

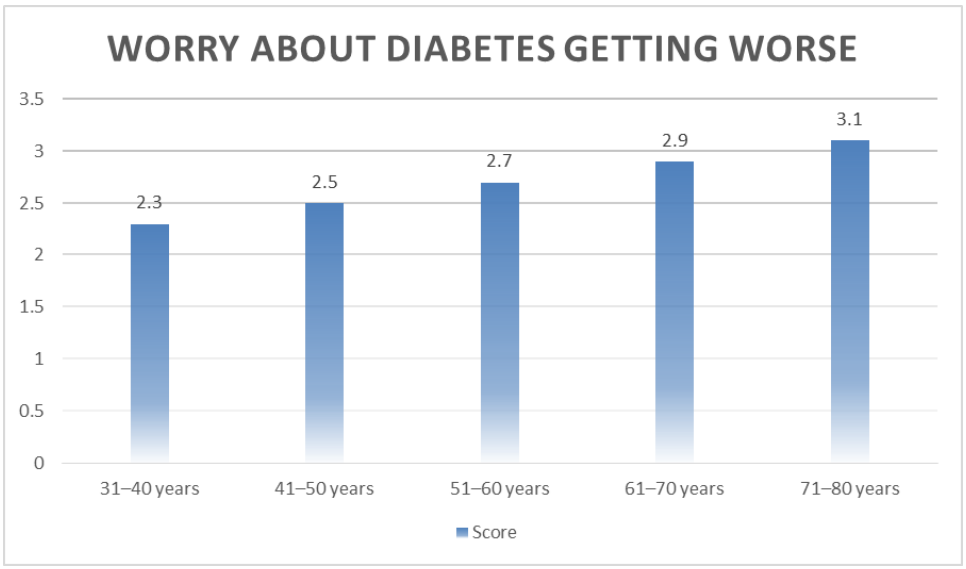
- All the time
- Most of the time
- Some of the time
- A little of the time
- None of the time

Age Group	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Score
31–40	11	20	23	18	8	2.1
41–50	10	17	25	16	9	2.4
51–60	10	18	26	13	7	2.6
61–70	8	16	28	20	8	2.8
71–80	7	15	24	19	9	3



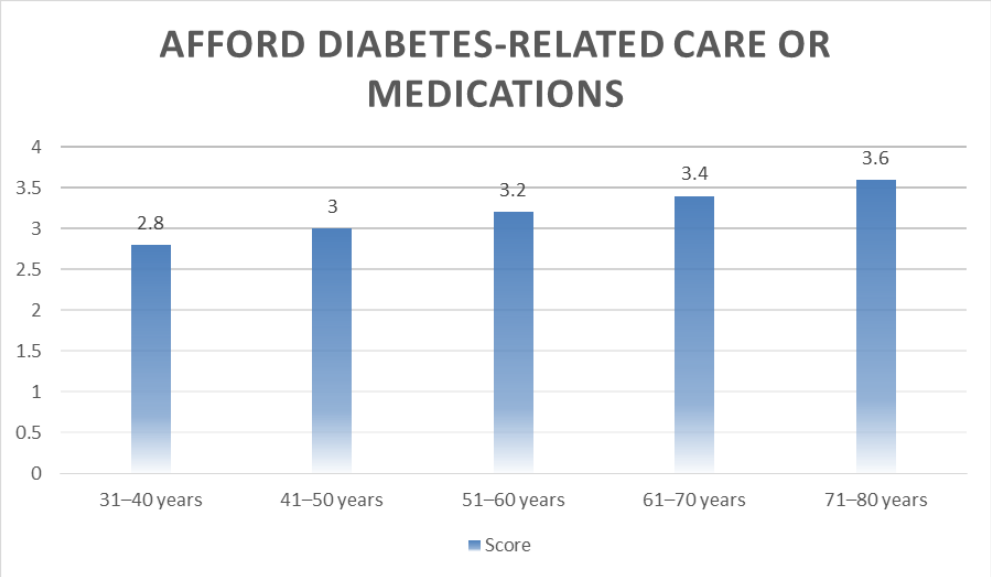
Q12. How often do you worry about diabetes getting worse?

Age Group	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Score
31–40	10	18	24	19	9	2.3
41–50	9	16	26	17	8	2.5
51–60	9	17	25	15	7	2.7
61–70	7	15	28	21	9	2.9
71–80	6	14	24	20	10	3.1



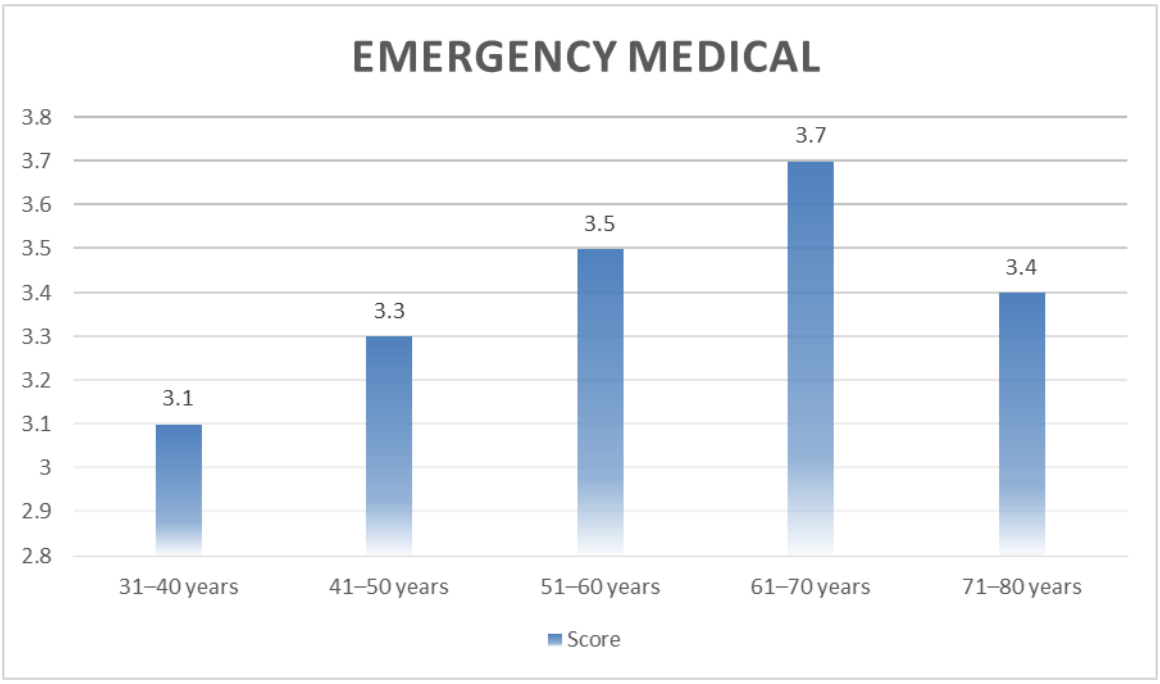
Q13. How often do you worry about not being able to afford diabetes-related care or medications?

Age Group	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Score
31–40	11	20	24	17	8	2.8
41–50	10	16	26	16	8	3
51–60	10	18	25	14	7	3.2
61–70	8	16	27	21	8	3.4
71–80	7	15	23	20	9	3.6



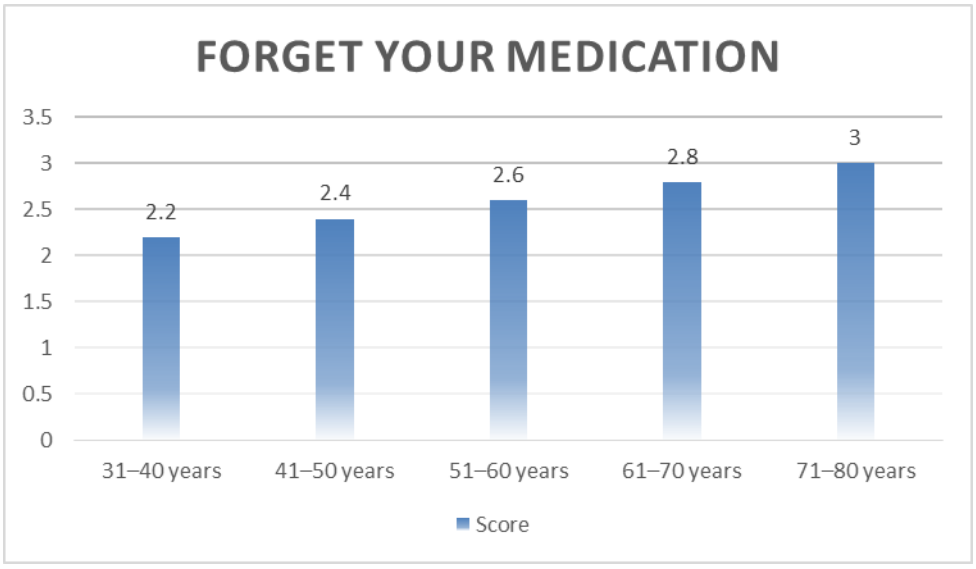
Q14. How often do you worry about needing emergency medical help because of your diabetes?

Age Group	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Score
31–40	12	21	22	17	8	3.1
41–50	11	17	25	15	8	3.3
51–60	10	18	26	13	7	3.5
61–70	9	17	27	20	7	3.7
71–80	7	15	24	19	9	3.4



Q15. How often do you worry about what might happens if you forget your insulin or medication?

Age Group	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Score
31–40	11	20	23	18	8	2.2
41–50	10	17	25	16	8	2.4
51–60	10	18	25	14	7	2.6
61–70	8	16	27	21	8	2.8
71–80	7	15	23	20	9	3



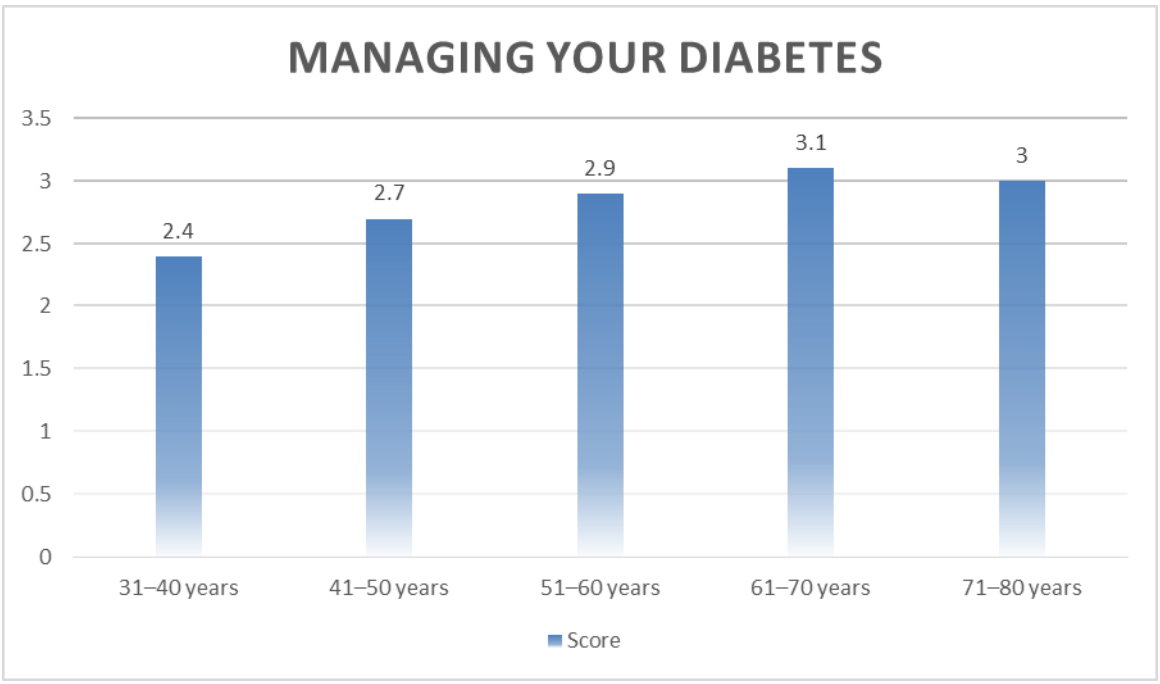
Social and Emotional Impact of Diabetes (Domain 4)

(Scale: 1 = all the time, 5 = none of the time)

Q16. How often do you How often do you feel frustrated in managing your diabetes?

- All the time
- Most of the time
- Some of the time
- A little of the time
- None of the time

Age Group	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Score
31–40	11	19	24	18	8	2.4
41–50	10	16	25	17	8	2.7
51–60	9	18	25	15	7	2.9
61–70	8	15	27	21	8	3.1
71–80	6	14	24	21	9	3

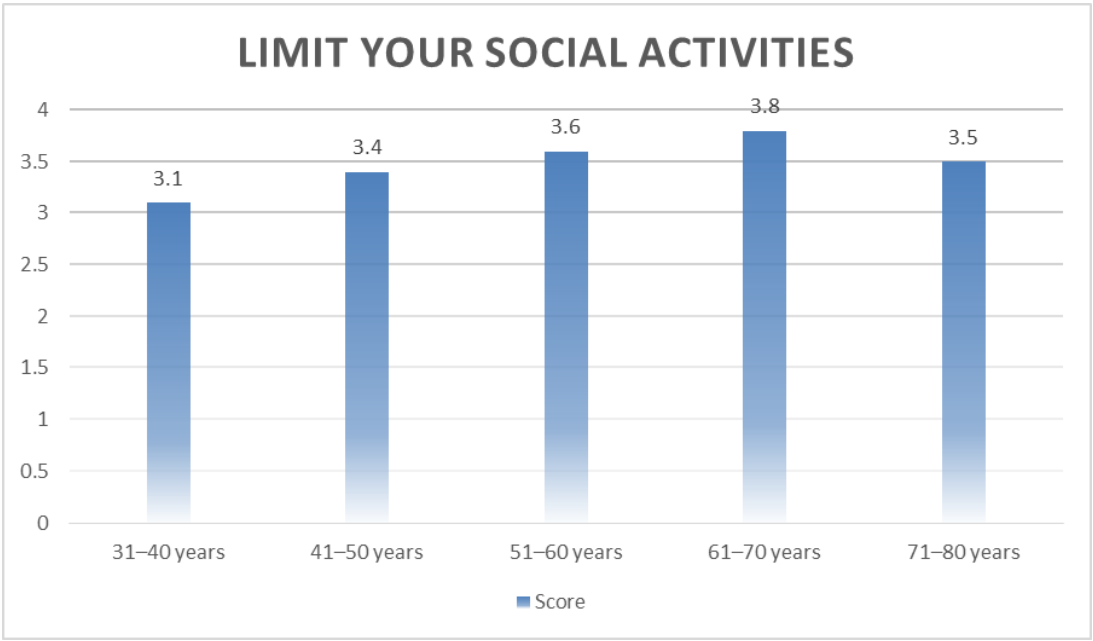


Q17. How much do you feel diabetes limits your ability to enjoy life with others?

Age Group	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Score
31–40	11	20	23	18	8	3
41–50	10	17	25	16	8	3.2
51–60	9	18	25	15	7	3.4
61–70	8	15	27	21	8	3.7
71–80	7	14	24	21	9	3.3

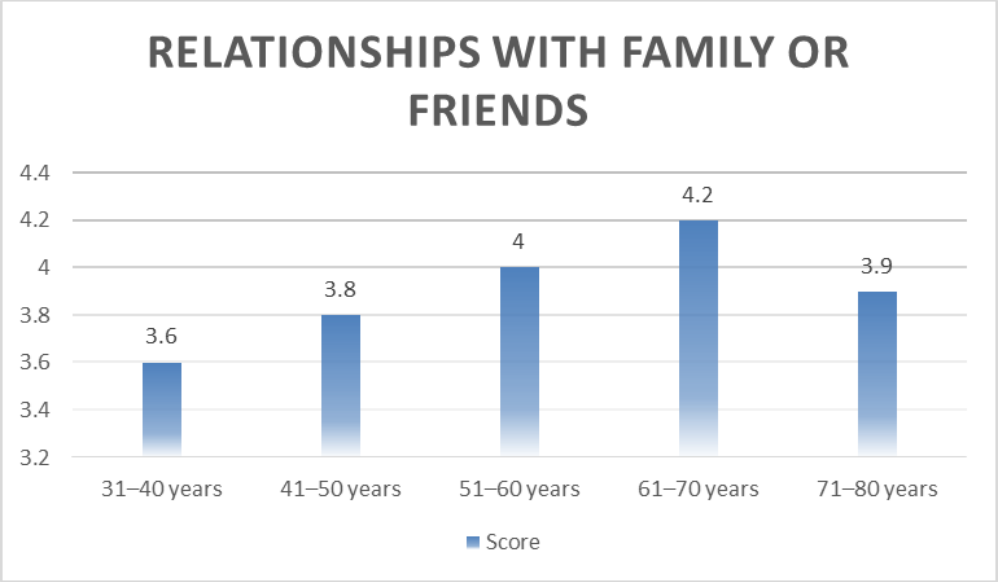
Q18. How often do you feel diabetes limit your social activities?

Age Group	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Score
31–40	10	19	24	19	8	3.1
41–50	9	17	26	16	8	3.4
51–60	9	18	25	14	8	3.6
61–70	7	16	27	21	9	3.8
71–80	6	15	24	20	9	3.5



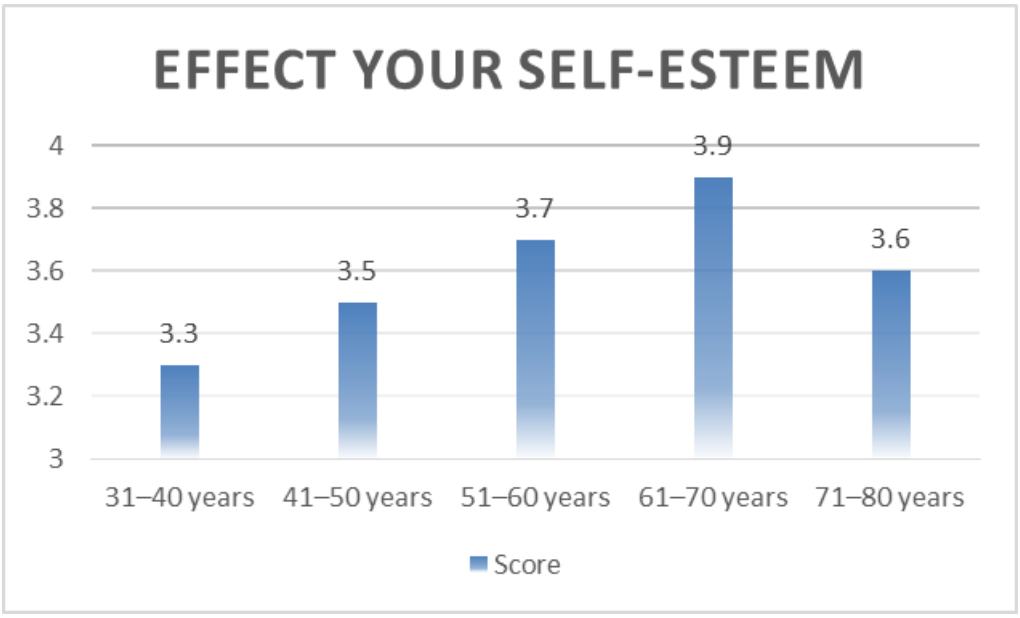
Q19. How often do you feel that diabetes affects your relationships with family or friends?

Age Group	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Score
31–40	11	20	23	18	8	3.6
41–50	10	17	25	16	8	3.8
51–60	9	18	25	15	7	4
61–70	8	15	27	21	8	4.2
71–80	7	14	24	21	9	3.9



Q20. How often do you feel diabetes effect your self-esteem?

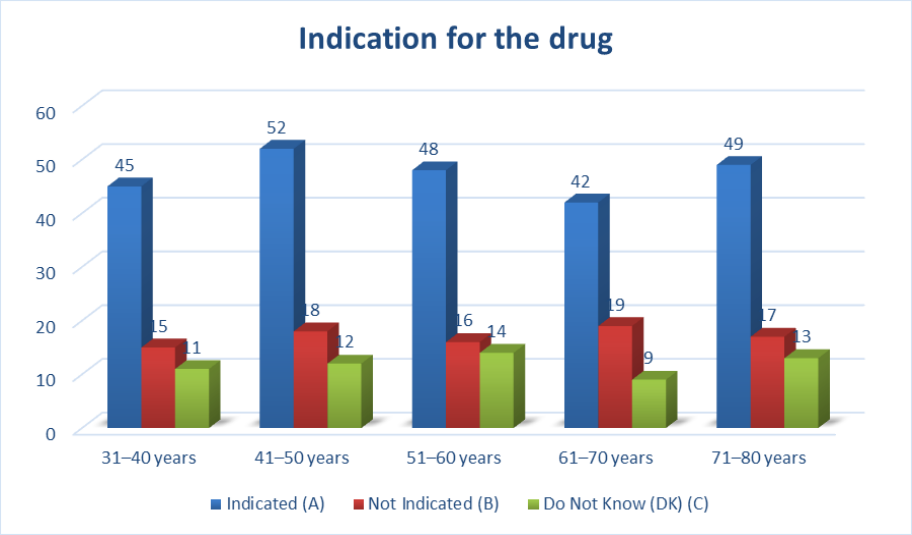
Age Group	Very satisfied	Satisfied	Neither satisfied nor dissatisfied	Dissatisfied	Very dissatisfied	Score
31–40	10	19	24	19	8	3.3
41–50	9	17	26	16	8	3.5
51–60	9	18	25	14	8	3.7
61–70	7	16	27	21	9	3.9
71–80	6	15	24	20	9	3.6



Medication Appropriateness Index (MAI) Questions and Options

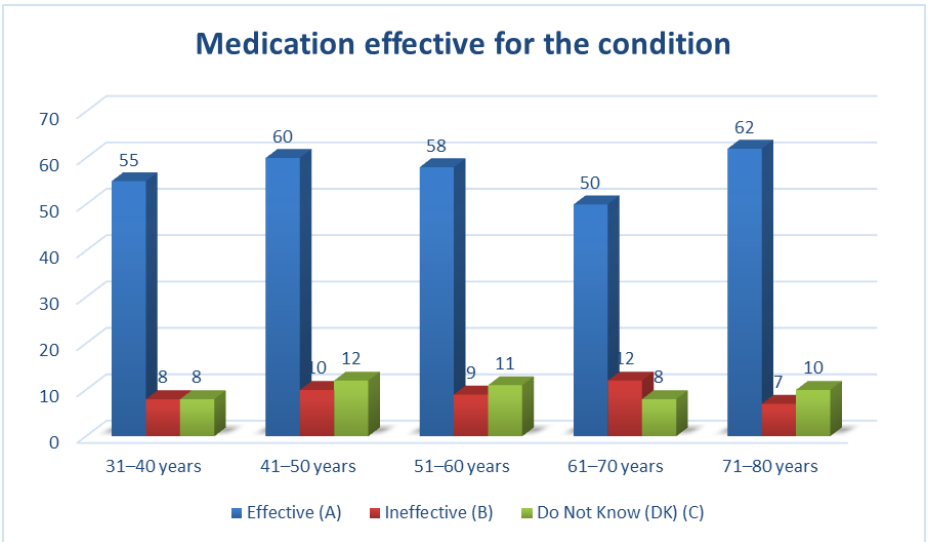
1. **Is there an indication for the drug?**
   - A: Indicated
   - B: Not Indicated
   - C: Do Not Know (DK)

Age Group	Indicated (A)	Not Indicated (B)	Do Not Know (DK) (C)	Score
31–40	45	15	11	2.1
41–50	52	18	12	2.5
51–60	48	16	14	2.8
61–70	42	19	9	3
71–80	49	17	13	3.2



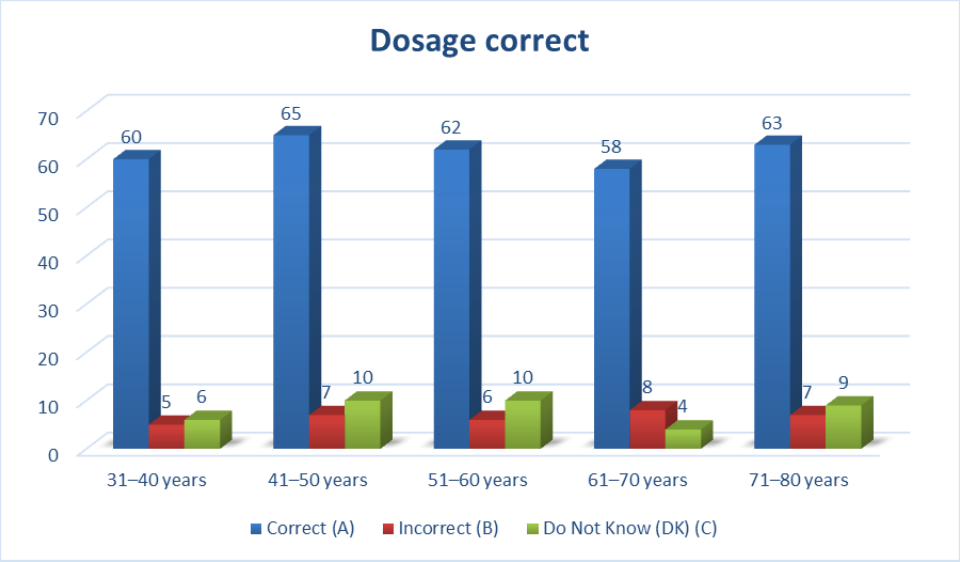
2. **Is the medication effective for the condition?**
   - A: Effective
   - B: Ineffective
   - C: Do Not Know (DK)

Age Group	Effective (A)	Ineffective (B)	Do Not Know (DK) (C)	Score
31–40	55	8	8	2.6
41–50	60	10	12	2.9
51–60	58	9	11	3.1
61–70	50	12	8	3.3
71–80	62	7	10	3.5



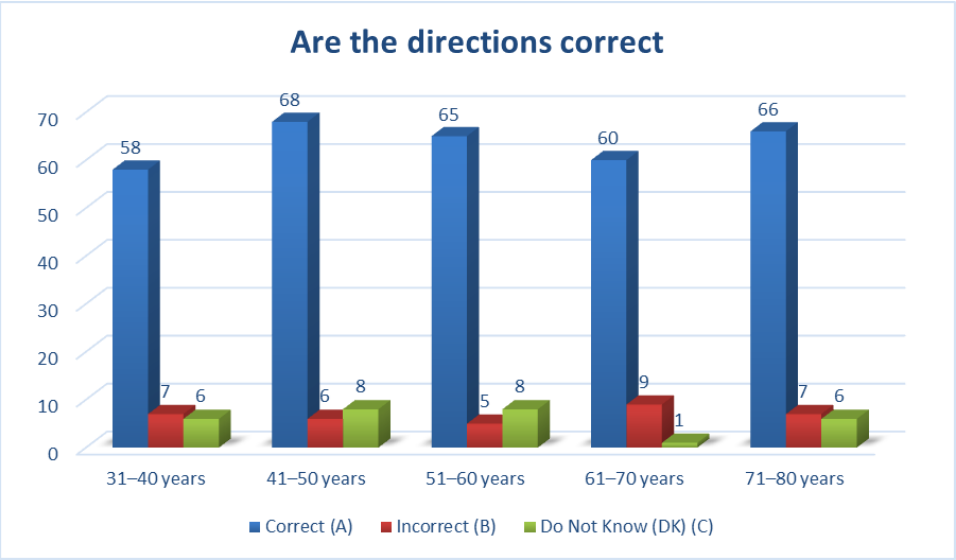
3. **Is the dosage correct?**
   - A: Correct
   - B: Incorrect
   - C: Do Not Know (DK)

Age Group	Correct (A)	Incorrect (B)	Do Not Know (DK) (C)	Score
31–40	60	5	6	1.8
41–50	65	7	10	2
51–60	62	6	10	2.2
61–70	58	8	4	2.5
71–80	63	7	9	2.3



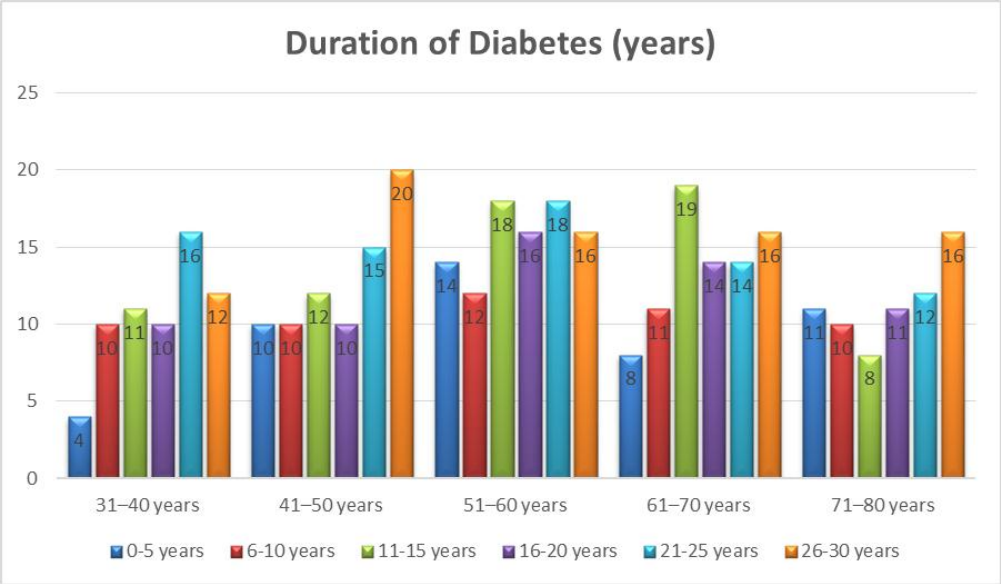
4. **Are the directions correct?**
   - A: Correct
   - B: Incorrect
   - C: Do Not Know (DK)

Age Group	Correct (A)	Incorrect (B)	Do Not Know (DK) (C)	Score
31–40	58	7	6	2.9
41–50	68	6	8	3.2
51–60	65	5	8	3
61–70	60	9	1	3.5
71–80	66	7	6	3.3



Duration of Diabetes (years)

Age Group	0–5 yrs	6–10 yrs	11–15 yrs	16–20 yrs	21–25 yrs	26–30 yrs
31–40 years	4	10	11	10	16	12
41–50 years	10	10	12	10	15	20
51–60 years	14	12	18	16	18	16
61–70 years	8	11	19	14	14	16
71–80 years	11	10	8	11	12	16
Total	**47**	**53**	**68**	**61**	**75**	**80**

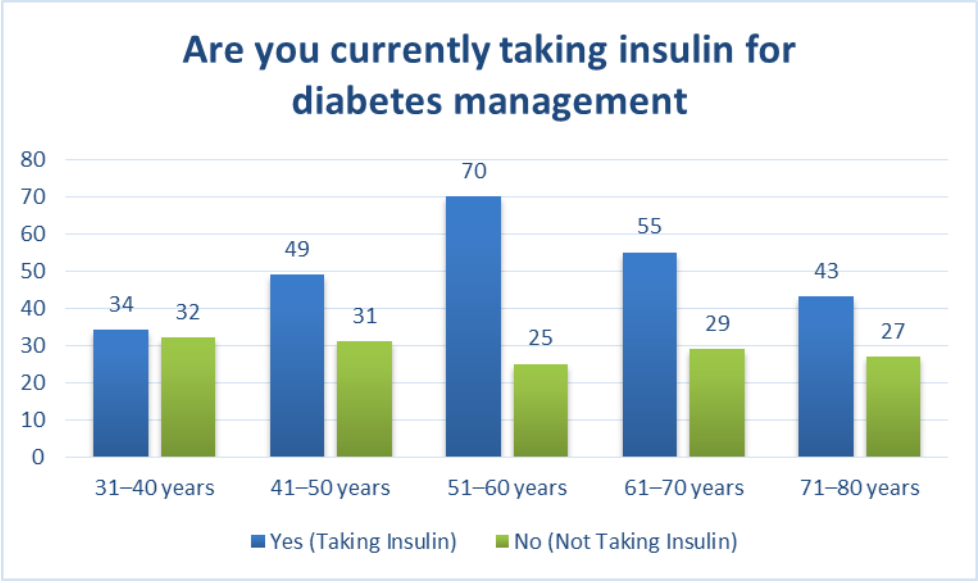


Polypharmacy

1. Are you currently taking insulin for diabetes management?

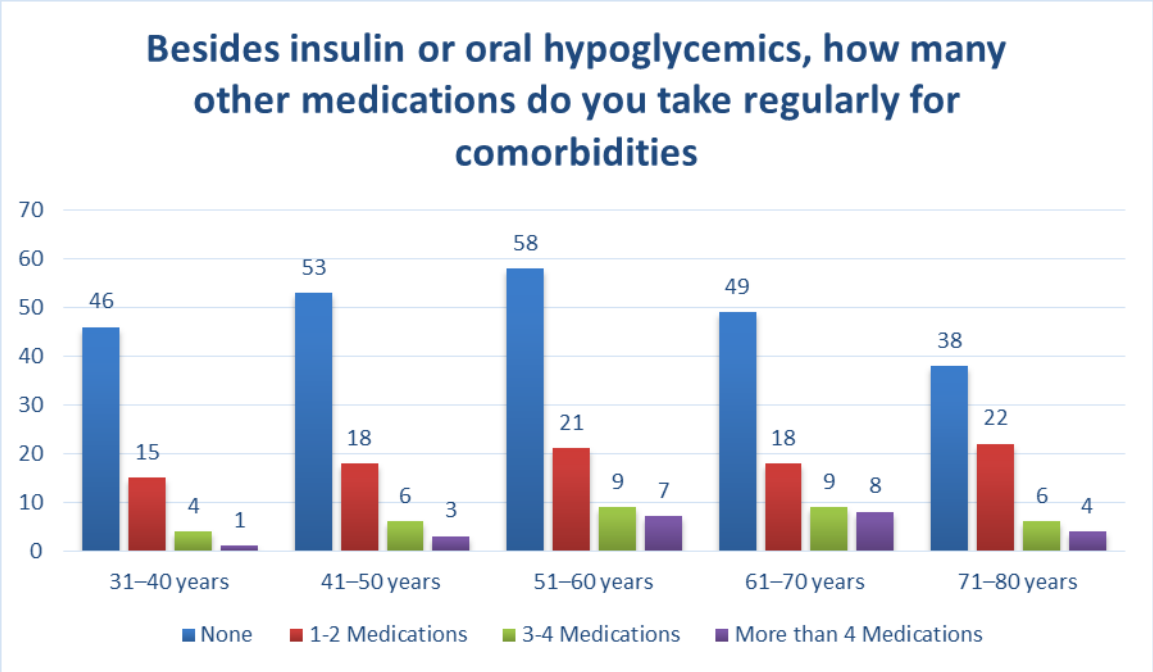
- ☐ Yes ☐ No

Age Group	Yes (Taking Insulin)	No (Not Taking Insulin)	Total
31–40 years	34	32	66
41–50 years	49	31	80
51–60 years	70	25	95
61–70 years	55	29	84
71–80 years	43	27	70



2. Besides insulin or oral hypoglycemics, how many other medications do you take regularly for comorbidities?
   - ☐ None ☐ 1-2 ☐ 3-4 ☐ More than 4

Age Group	None	1-2 Medications	3-4 Medications	More than 4 Medications	Total
31–40 years	46	15	4	1	66
41–50 years	53	18	6	3	80
51–60 years	58	21	9	7	95
61–70 years	49	18	9	8	84
71–80 years	38	22	6	4	70



DISCUSSION

The study explored the quality of life, health status, comorbidities, and treatment profiles among diabetic patients across different age groups. Results indicated that the majority were aged 51–80 years, with a nearly even gender distribution. Occupations varied, though retired individuals and teachers formed a considerable portion among older groups. Educational levels were relatively high among the 31–60-year cohort.

Notably, diabetes duration averaged longer in older age groups, aligning with an increased number of medications and comorbidities like hypertension, neuropathy, and dyslipidemia. The majority reported moderate satisfaction with health and daily activities, but challenges remained in areas such as sleep quality, physical pain, and financial support for diabetes management.

HbA1c levels across all groups remained above 8%, signaling poor glycemic control. Despite regular blood sugar monitoring, hospitalization rates remained relatively high, reflecting the chronic complications associated with long-term diabetes.

Overall, younger patients reported slightly better quality of life and healthcare access, while older patients faced more physical limitations but had slightly higher emotional satisfaction, indicating resilience. Financial and informational access emerged as vital determinants of patient satisfaction and health outcomes.

CONCLUSION

This study highlights the complex interplay between age, diabetes duration, comorbidities, treatment complexity, and quality of life. Despite access to medications and healthcare services, glycemic control remains suboptimal across all age groups. Age-related deterioration in physical capabilities impacts daily life and personal satisfaction. Younger individuals showed better health perceptions, while older adults demonstrated better emotional adaptation but faced more health challenges. Targeted interventions focusing on education, financial aid, personalized healthcare access, and lifestyle support are essential to improving the overall quality of life in diabetic patients across age groups.

In conclusion, as polypharmacy becomes increasingly common among individuals with diabetes, especially those with multiple health conditions, it is crucial to examine not only the number of medications prescribed but also their appropriateness. Inappropriate or excessive medication use can negatively impact patients' quality of life, daily functioning, and overall health outcomes. By using tools like the Medication Appropriateness Index (MAI) and the Diabetes Quality of Life (DQOL)

questionnaire, this study seeks to better understand how medication burden affects patients across different age groups. The findings can guide healthcare providers, including pharmacists, in making more informed, patient-centered decisions that balance clinical effectiveness with the goal of maintaining or improving quality of life. This approach is essential to delivering safer, more effective diabetes care in all age groups.

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