



www.bioinformation.net
Volume 22(8)



Research Article

Received August 1, 2026; Revised August 31, 2026; Accepted August 31, 2026, Published August 31, 2026

DOI: 10.6026/973206300224705

SJIF 2026 (Scientific Journal Impact Factor for 2026) = 8.478

2022 Impact Factor (2023 Clarivate Inc. release) is 1.9

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Citation: Govindhan *et al.* Bioinformation 22(8): 4705-4711 (2026)

Lifestyle modification and perceived barriers affect quality of life in Type 2 diabetes patients

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Abstract:

Type 2 diabetes mellitus is a growing global health problem and inadequate awareness regarding lifestyle modification increases the risk of complications and mortality. A cross-sectional study was conducted among 150 type 2 diabetic patients at Sukhda Multi-Speciality Hospital using a structured questionnaire and statistical analysis including Pearson correlation and ANOVA. The findings revealed that 74% of participants had moderate awareness, while 72% showed poor lifestyle modification practices despite the high prevalence of co-morbidities. A significant positive correlation was observed between awareness and practice scores ($P=0.004$), indicating that better awareness contributes to improved lifestyle practices among diabetic patients. Thus, data shows the critical role of awareness in promoting effective lifestyle modifications for better blood sugar control and improved quality of life in type 2 diabetes patients.

Keywords: Type 2 diabetes (T2DM), lifestyle modification, knowledge, practice, barrier

Background:

Type 2 diabetes is a chronic condition characterised by impaired glucose metabolism. Sedentary living, obesity and dietary habits play a predominant role in development of type 2 diabetes [1]. Changes in the behaviour and adapting to healthy lifestyle habits would prevent the development of diabetes as well as diabetes related complications [2]. Adequate knowledge regarding lifestyle modification is an important prerequisite for the management and prevention of diabetic related complications. Unawareness regarding lifestyle changes not only affects the quality of life, but also patients with type 2 diabetes mellitus will be developing negative attitude towards their life [3]. Awareness regarding lifestyle and implementing it in daily life will bring significant reduction in required dosage of anti-diabetic medications [4]. Experimental studies found that regular practice and adherence to healthy lifestyle behaviour have brought considerable improvement in the blood glucose levels of diabetic patients [5]. Despite having adequate awareness regarding the importance of lifestyle modifications, adherence to the practice and positive behaviour change is very poor. Unfortunately, most of the studies stated that practice on dietary modifications and physical activity remains poor due to the less enthusiasm and poor self-discipline, which necessitates positive re-enforcement and motivation in people with type 2 diabetes [6]. Various studies conducted on barriers regarding lifestyle modifications among type 2 diabetes found that the study participants had inadequate knowledge about the choice of diet, not finding time for physical activity and faced financial burden in relation to medication adherence and blood glucose monitoring, lack of motivation in behaviour change [7]. Physical pain due to osteoarthritis, neuropathy and generalised weakness prevents the ability in performing exercise. Despite the Strong scientific evidence on importance of lifestyle modification in glycaemic control among diabetes patients the compliance and adherence to the behaviour change is not much satisfactory, challenges continue in their application and sustainability [8]. Therefore, it is interest to assess the awareness, practice and barriers related to lifestyle modifications among patients with type 2 diabetes mellitus in order to develop effective health

promotion strategies and improve glycaemic control and quality of life.

Methods:

The present study was descriptive cross-sectional study. Ethical approval NCON- IES/38/2023 was obtained from the Institutional Ethics Committee. Sukhda Multi speciality hospital, Hisar district, Haryana was selected as a study setting, on an average 50-70 patients with type 2 diabetes visits this hospital for follow up and treatment on a daily basis. Formal permission had been obtained from the Medicine and Endocrinology outpatient department of Sukhda Multi-speciality hospital, Hisar. Sample size was calculated by using the formula:

$$n = \frac{\frac{Z^2 \cdot P(1-P)}{e^2}}{1 + \frac{Z^2 \cdot P(1-P)}{e^2 \cdot N}}$$

$N=Z^2 \times P(1-P)$, N = Population size, n =sample size, z = confidence level, p = expected prevalence e = margin of error and sample size was determined as 150 type 2 diabetic patients fulfilling the inclusion criteria was selected as samples for this study. Patients with type 2 diabetes visiting the hospital for follow up and treatment and willing to participate in the study was included as inclusion criteria, gestational diabetes mellitus and patients with type I diabetes mellitus was excluded from the study. Non-probability, convenient sampling technique was used to select the sample for the study. Structured questionnaire was used for data collection from the participants. The instrument comprised of Section A- Socio demographic variables, Section B- Awareness regarding lifestyle modifications, this consisted of 13 questions with the option of yes or no, with the maximum score of 13 Section C-Checklist for assessing practice on lifestyle modifications with 9 questions, with the maximum score of 9 Section D-14 questionnaire on Barriers which included yes /no options with the maximum score of 14. Content validity of the tool was obtained from subject experts in Nursing and endocrinologists. Suggestions from the experts were incorporated in the tool; Reliability of the tool was assessed for

its consistency& accuracy by Test- Retest method. The reliability of the awareness was found to be $r=0.80$, practice $r=0.81$ and barriers $r=0.85$ respectively. Informed consent was obtained from the participants and the data was collected for the period of 5 months. It took 15-20 minutes to complete the responses from the participants for the structured questionnaire. All the data were coded and entered in excel sheet. Analysis was carried out based on the objectives of the study. SPSS version 18 was used for descriptive and inferential statistical analysis. Pearson correlation was used for assessing the correlation between awareness and practice, practice and barriers and awareness and barrier. Multivariate analysis, Anova was used for the study to find the between-subject effects.

Results:

The data presented in the **Table 1** shows the description of socio-demographic variables, mean age of the study subjects was 54.41 ± 9.31 . Maximum of the participants were of male (55.3%), most of the participants (24.7 %) had secondary education has highest educational qualification, 30% of them were unemployed, 99% of them belongs to Hindu religion, 52% of the participants were from rural area, half of the participants 52% were from nuclear family, 56.7% of the participants did not have the family history of type 2 diabetes, 60% of the participants had the presence of co-morbidity. **Table 2** Provides the description frequency and percentage distribution of awareness score with the maximum score of 13 and minimum of zero. The present study found that 74% (111) of the participants had Moderate knowledge regarding lifestyle modification. In **Figure 1** the mean awareness score is 8.01, with a median of 8.00, indicating that most participants fall in the moderate awareness range. The standard deviation is 1.92, showing a moderate variation in scores. Scores ranged from a minimum of 4 to a maximum of 13, giving a range of 9. The mean percentage score is 61.6%, suggesting that participants, on average, have a fair level of awareness. In **Table 3** Out of the Total participants (150), the Majority 72.7% (109) had poor practice (scores between 0-2), while 26.7% showed fair practice (scores between 3, 4), only 0.7% had good practice regarding lifestyle modification. In **Table 4** More than half of the participants (56.7%) reported engaging in some form of physical exercise as part of their lifestyle modification, while 43.3% did not exercise. However, when looking at exercise frequency, 40.7% said they do not exercise at all and only 33.3% exercised daily. Among those who exercised, the vast majority (94.1%) preferred brisk walking, with very few choosing other forms like jogging or gardening. When it comes to exercise duration, an impressive 96.5% exercised for 30 minutes or more and they were consistent with the recommended time. Despite this, only 37.3% regularly monitored their body weight, while 62.7% did not, showing a gap in follow-through on health management. Dietary habits showed that 58% followed dietary recommendations and 42% were not adhering to the dietary recommendations. In terms of substance use, 13.3% of

participants smoked and 12% consumed alcohol, but the majorities were non-smokers (86.7%) and non-alcoholics (88%). **Figure 2** Represents out of the total participants (n=150) 65.3% had low barrier scores (0-5), indicating fewer obstacles in adopting healthy lifestyle practices. Another 34.7% had moderate barrier scores (6-10), showing some challenges in lifestyle changes. Noticeably participants never had high barrier scores (11-14), suggesting that severe barriers were absent in this group. **Figure 3** provides the Pearson’s correlation analysis between the practice score and awareness score among 150 participants revealed a correlation coefficient of 0.232. The mean practice score was 1.77 (SD = 1.124), while the mean awareness score was 8.01 (SD = 1.918). The correlation was statistically significant ($p = 0.004$), as the p-value was less than 0.05 and the calculated value exceeds the table value (0.160). This result indicates a significant positive relationship between awareness and practice scores—higher awareness was associated with better practice among participants. **Figure 4** provides the Pearson’s correlation analysis was conducted to determine the relationship between practice score and barrier score among 150 participants. The mean practice score was 1.77 (SD = 1.124) and the mean barrier score was 4.52 (SD = 1.982). The calculated correlation coefficient was -0.082, which was very close to zero, indicating a negligible negative relationship between the two variables. The correlation was not statistically significant ($p = 0.317$), as the p-value was greater than 0.05 and the calculated value was less than the table value (0.160). Thus, there was no significant association between practice scores and barrier scores. **Figure 5** provides the Pearson's correlation between awareness score and barrier score is -0.260, with a p-value of 0.001, which is statistically significant (since $p < 0.05$ and the table value is 0.160). There is a significant negative correlation between awareness and barrier scores. This means as awareness increases, the perceived barriers tend to decrease and vice versa. This suggests that improving awareness may help reduce the barriers experienced by individuals, supporting the need for educational or informational interventions. **Table 5** between subject effects describes the corrected model for Awareness score, gender showed a highly significant effect ($F = 85.618, p < 0.001$). Practice score is statistically significant ($F = 2.072, p = 0.003$), showing that the included factors explain a significant amount of variance in practice scores. The main effect of gender is significant ($F = 9.966, p = 0.002$), indicating that practice scores differ significantly between males and females. Occupation is also significant ($F = 2.564, p = 0.017$), meaning that practice scores vary by occupation category. Place of residence (urban vs. rural) is significant for practice ($F = 5.009, p = 0.027$). Other factors such as age, education, marital status, family history and income were not significant for the practice score ($p > 0.05$). For Barrier score, gender ($F = 4.314, p = 0.040$), occupation ($F = 4.824, p = 0.030$) and income ($F = 4.824, p = 0.030$) were significant.

Table 1: Demographic characteristics of the subjects (n=150)

Socio Demographic characteristics		Frequency(F)	Percentage (%)
Age	30-40 years	9	6

Gender	41-50 years	48	32
	51-60 years	45	30
	61-70 years	48	32
	Male	83	55.3
Education	Female	67	44.7
	Illiterate	32	21.3
	Primary	31	20.7
	Secondary	37	24.7
Occupation	Higher Secondary	23	15.3
	Undergraduate	11	7.3
	Postgraduate	16	10.7
	Professional	4	2.7
Religion	Clerical	4	2.7
	Shop owner	29	19.3
	Farm	18	12
	Skilled worker	44	29.3
Marital Status	Semi- skilled worker	3	2
	Unskilled Worker	3	2
	Unemployed	45	30
	Hindu	149	99.3
Place of residence	Christian	1	0.7
	Muslim	0	0
	Other	0	0
	Single	0	0
Type of family	Married	146	97.3
	Widower	4	2.7
	Divorced	0	0
	Urban	72	48
Monthly Income	Rural	78	52
	Semi Urban	0	0
	Joint family	72	48
	Nuclear family	78	52
Presence of Family history of Type 2 diabetes	Extended Family	0	0
	Less than Rs. 15,000	105	70
	Rs. 15,001-20,000	21	14
	Rs.20,001 and above	24	16
Duration of having diabetes	Yes	65	43.3
	No	85	56.7
	0-5 year	78	52
	6-10 year	56	37.3
Presence of Co-morbidity	11-15 year	15	10
	16-20 year	1	0.7
	Yes	91	60.7
	No	59	39.3
Smoking habits	Yes	28	18.7
	No	122	81.3
Alcohol habits	Yes	19	12.7
	No	131	87.3

Table 4: Practice Profile of the Subjects

Practice proforma		Frequency(f)	Percentage (%)
Do you engage in any form of physical exercise as part of lifestyle modification?	Yes	85	56.7
	No	65	43.3
How often do you engage in physical exercise?	Daily	50	33.3
	Once weekly	17	11.3
	At least thrice weekly	19	12.7
	Once monthly	3	2
	Not at all	61	40.7
	Other	0	0
In what kind of physical exercises do you participate?	Brisk walking	80	94.1
	Cycling	0	0
	Jogging	2	2.4
	Sports activities	0	0
	Gardening/farming	1	1.2
	Others	2	2.4
What is the usual duration of your physical exercise?	Less than 10 minutes	0	0
	10-19minutes	0	0
	20-29 minutes	3	3.5
	30 minutes and above	82	96.5
	Others	0	0
I monitor my body weight regularly	Yes	56	37.3
	No	94	62.7

Do you follow your dietary recommendations?	Yes	87	58
	No	63	42
How often do you follow your dietary recommendations	Always	80	53.3
	Not always	63	42
	Sometimes	7	4.7
I smoke	Yes	20	13.3
	No	130	86.7
I Drink alcohol	Yes	18	12
	No	132	88

Table 5: Tests of between subject effects

Tests of Between-Subjects Effects						
Source		Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Awareness Score	124.507 ^a	29	4.293	1.217	0.23
	Barrier Score	149.355 ^b	29	5.15	1.417	0.099
	Practice	62.817 ^c	29	2.166	2.072	0.003
	Awareness Score	302.137	1	302.137	85.618	0
	Barrier Score	15.676	1	15.676	4.314	0.04
	Practice	10.42	1	10.42	9.966	0.002
Age	Awareness Score	7.906	3	2.635	0.747	0.526
	Barrier Score	7.161	3	2.387	0.657	0.58
	Practice	3.499	3	1.166	1.115	0.346
Gender	Awareness Score	0.342	1	0.342	0.097	0.756
	Barrier Score	0.71	1	0.71	0.195	0.659
	Practice	0.411	1	0.411	0.393	0.532
Education	Awareness Score	8.073	5	1.615	0.458	0.807
	Barrier Score	27.662	5	5.532	1.522	0.188
	Practice	5.853	5	1.171	1.119	0.354
Occupation	Awareness Score	36.75	7	5.25	1.488	0.178
	Barrier Score	22.035	7	3.148	0.866	0.535
	Practice	18.768	7	2.681	2.564	0.017
Religion	Awareness Score	10.092	1	10.092	2.86	0.093
	Barrier Score	0.751	1	0.751	0.207	0.65
	Practice	0.728	1	0.728	0.696	0.406
Marital Status	Awareness Score	13.077	1	13.077	3.706	0.057
	Barrier Score	0.18	1	0.18	0.05	0.824
	Practice	0.007	1	0.007	0.007	0.936
Place of residence	Awareness Score	5.379	1	5.379	1.524	0.219
	Barrier Score	12.331	1	12.331	3.393	0.068
	Practice	5.238	1	5.238	5.009	0.027
Type of family	Awareness Score	0.169	1	0.169	0.048	0.827
	Barrier Score	1.656	1	1.656	0.456	0.501
	Practice	1.391	1	1.391	1.33	0.251
Monthly Income	Awareness Score	3.097	2	1.549	0.439	0.646
	Barrier Score	5.288	2	2.644	0.728	0.485
	Practice	0.314	2	0.157	0.15	0.861
Presence of F/H of Type 2 diabetes	Awareness Score	0.544	1	0.544	0.154	0.695
	Barrier Score	0.15	1	0.15	0.041	0.839
	Practice	2.197	1	2.197	2.101	0.15
Duration of having diabetes	Awareness Score	6.088	3	2.029	0.575	0.632
	Barrier Score	27.877	3	9.292	2.557	0.058
	Practice	4.319	3	1.44	1.377	0.253
Diagnosis of Co-morbid	Awareness Score	5.856	1	5.856	1.659	0.2
	Barrier Score	3.923	1	3.923	1.08	0.301
	Practice	0.751	1	0.751	0.718	0.398
Smoking habits	Awareness Score	6.518	1	6.518	1.847	0.177
	Barrier Score	17.532	1	17.532	4.824	0.03
	Practice	2.914	1	2.914	2.787	0.098
Alcohol habits	Awareness Score	0	1	0	0	0.993
	Barrier Score	0.917	1	0.917	0.252	0.616
	Practice	2.02	1	2.02	1.932	0.167
Error	Awareness Score	423.466	120	3.529		
	Barrier Score	436.085	120	3.634		
	Practice	125.477	120	1.046		
Total	Awareness Score	10180	150			
	Barrier Score	3650	150			
	Practice	660	150			
Corrected Total	Awareness Score	547.973	149			
	Barrier Score	585.44	149			
	Practice	188.293	149			

a. R Squared = .227 (Adjusted R Squared = .040)

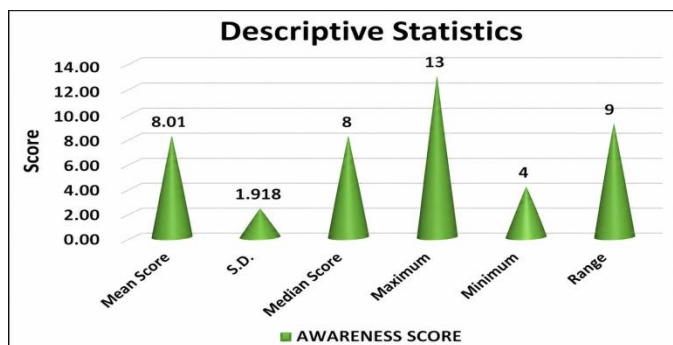
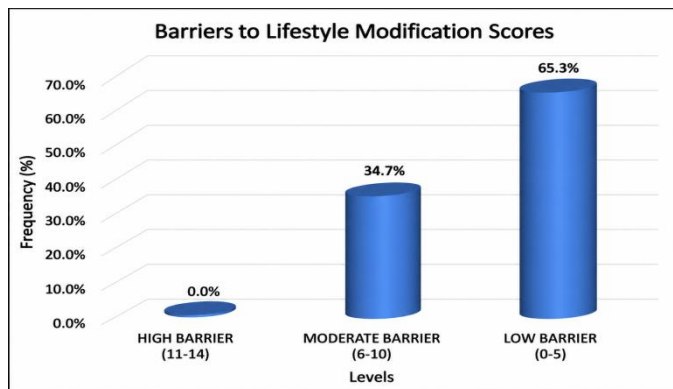
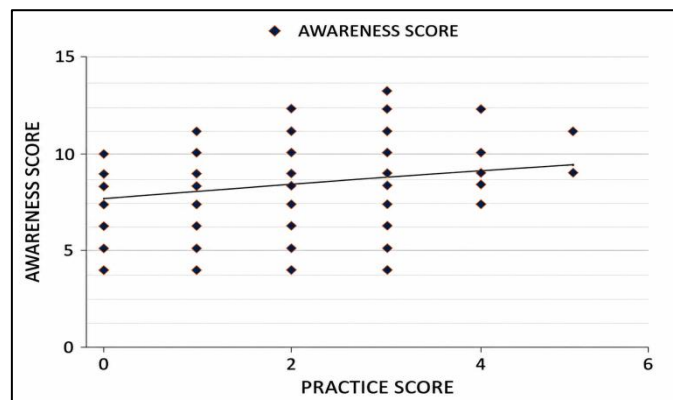
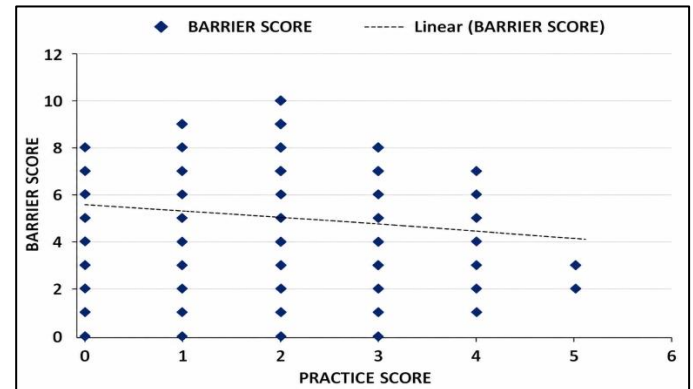
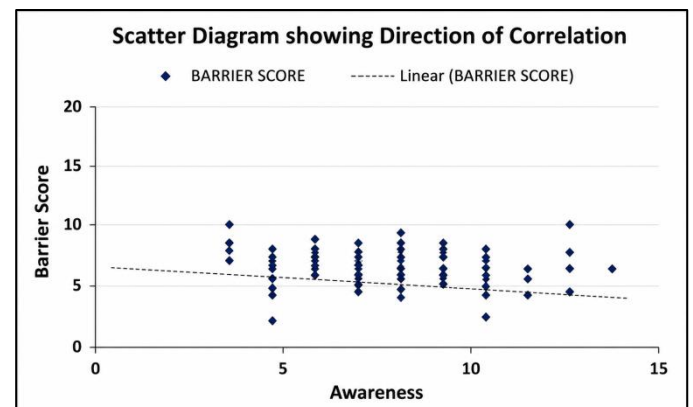
b. R Squared = .255 (Adjusted R Squared = .075)
 c. R Squared = .334 (Adjusted R Squared = .173)

Table 2: Frequency & Percentage distribution of Awareness Scores (n=150)

Criteria measure of Awareness score		
Category score	Frequency	Percentage%
Adequate (10-13)	33	22
Moderate (5-9)	111	74
Low (0-4)	6	4

Table 3: Frequency & Percentage distribution of Practice Scores

Criteria measure of Practice score n= (150)		
CATEGORY SCORE	FREQUENCY	PERCENTAGE
Good practice (5)	1	0.7
Fair (3-4)	40	26.7
Poor (0-2)	109	72.7

**Figure 1:** Descriptive statistics of awareness scores**Figure 2:** Barriers to lifestyle modification scores**Figure 3:** Scatter diagram showing direction of correlation of awareness score versus practice score**Figure 4:** Scatter diagram showing direction of correlation of barrier score versus practice score**Figure 5:** Scatter diagram showing direction of correlation of awareness score versus barrier score

Discussion:

Our study found that more than half of the participants were in the middle age group aged between 51 -70 years, which conveys that as the age advances prevalence of diabetes increases and it may be due to the exposure to stress for a longer time, higher percentage of them were male, the largest group had completed secondary education, 52% of them were known to be diabetic for more than 5 years of duration. Most of the participants (52%) were from the rural area, more than half of the participants did not have the family history of diabetes (56.7%). Maximum number (60.7%) of the participants had developed co- morbidity. Majority of the participants in the present study had Moderate level of awareness (74%) regarding lifestyle modification, the reason for this moderate awareness could be due to the regular follow up to the hospital and the participants would have acquired the information about the lifestyle management of diabetes from the physician treating. The present study is in consistent with the study findings of Kebede *et al.* (2022) [9].

Practice of lifestyle modification in this study found 72.7% were having low practice that was unsatisfactory and it was in support with previous studies conducted on lifestyle modifications. 56% of the participants were engaged in some form of physical exercise, 58% followed the dietary recommendations which is in line with the study conducted in Bangladesh and India. Brisk walking (94.1%) was the most preferred exercise practised by the participants. 43.3% did not perform any physical activity and did not involve themselves in any form of health improving activity which is in consistent with the study conducted by Geremew *et al.* (2023) [10]. The current study had identified poor self-control regarding diet, lack of awareness regarding choice of food, not getting adequate support from family members were considered has low level barriers in dietary regulation component which can be managed by motivation to the participant as well as their family members, performing exercise may exacerbate illness, busy work schedule, lazy to perform exercise, was the commonest barrier in regulation of physical activity among the participants. Presence of co-morbidity in the participants also contribute as a barrier in performing physical activity as they feel low energetic and less enthusiasm initiating and sustaining the physical activity. This study results were in congruence with the study conducted in Africa, non-adherence to the dietary regulation and exercise is mainly due to the unawareness regarding the seriousness of disease and its worsening complication [11]. There was a significant positive correlation between the awareness and practice score, with the correlation coefficient of $r = 0.232$ that indicates as the awareness regarding lifestyle modifications increases it influences the practice also There is a significant negative correlation between awareness and barrier scores. $r = -0.260$, this means as awareness increases, the perceived barriers tend to decrease and vice versa. Being aware about the importance of lifestyle modification can bring significant improvement in the practice as well reduce the barriers. The present study has been supported by the study conducted by Chen *et al.* (2025) [12]. The Multivariate analysis test interpreted that in between subject effects found that gender showed a highly significant effect with the awareness score of lifestyle modification ($F = 85.618$, $p < 0.001$). Gender, occupation and residence had statistically significant effect on practice ($F = 9.966$, $p = 0.002$), ($F = 2.564$, $p = 0.017$), ($F = 5.009$, $p = 0.027$)

respectively. Gender, occupation and income ($F = 4.314$, $p = 0.040$), ($F = 4.824$, $p = 0.030$), ($F = 4.824$, $p = 0.030$) were significant with barriers felt in lifestyle modification. Rural participants were less likely to follow the dietary restrictions in the current study as they were less exposed to the dietary information's and their cultural patterns of following the same plates of food for all the family members would be the reason for the barrier in dietary adherence, these results were supported by the study conducted at Ethiopia [13], the present study also found that (60.7%) of the participants had developed co-morbid condition other than the primary condition.

Conclusion:

Lifestyle modification and reduced perceived barriers improve quality of life in type 2 diabetes. Individualized education and behavioural support can strengthen long-term adherence. Integrating these strategies into routine care may improve diabetes outcomes.

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