ORIGINAL ARTICLE

Effect of Perceived Adherence to Lifestyle Changes On Quality of Life, Body Mass Index, And Blood Glucose Status For T2DM Patients @SASMEC

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Type 2 Diabetes Mellitus (T2DM); lifestyle modification; perceived adherence; Quality of Life (QoL); blood glucose level

ABSTRACT

Background: Adopting a healthier lifestyle with effective self-management can improve diabetes outcomes. For diabetic patients, perceived adherence is crucial in helping them sustain the recommended lifestyle changes. Thus, the current study was conducted to determine the association of perceived adherence level to lifestyle changes with the Quality of Life (QoL), body mass index (BMI), and blood glucose level of T2DM patients. **Methods:** Thirty-seven T2DM patients were recruited from the Medical Clinic at SASMEC@IIUM. All participants were interviewed and completed survey questions regarding the perceived adherence to lifestyle changes and quality of life. **Results:** Results found that most of the participants were obese 20 (54.1%), few were underweight 2 (5.4%), normal weight 8 (21.6%) and overweight 7 (18.9%). Most participants, 23 (62.2%) had presumed perceived adherence, and 14 (37.8%) had unpredictable perceived adherence, with no participants categorised as perceived non-adherence. There is no significant difference between perceived lifestyle changes and body mass index. The average total quality of life score was 40.4, indicating a good quality of life. There was a significant difference between perceived adherence to lifestyle change and quality of life. For most participants, 21 (60%) fasting blood glucose levels were equal to or more than 7.0 mmol/L, while 14 (40%) participants had normal fasting blood glucose values (<7.0mmol/L). The result found no significant difference between perceived adherence to lifestyle change and blood glucose status. **Conclusion:** This study highlights the substantial impact of perceived adherence to lifestyle changes on the quality of life (QoL) among diabetes patients, emphasising the importance of promoting adherence to improve overall well-being. However, no association was found between perceived adherence, BMI, or blood glucose levels. These findings indicate that the influence on metabolic outcomes such as BMI and blood glucose is more complex and likely influenced by other factors.

INTRODUCTION

Type 2 Diabetes Mellitus (T2DM) is a non-communicable disease that is concerning in Malaysia as it involves almost 1 in 5 adults in Malaysia (National Health Morbidity Survey, 2019). According to Ismail et al. (2023), T2DM is a condition where the level of blood glucose increases. It may lead to several organ dysfunctions, such as heart disease, blood vessels, eyes, kidneys, and nerves. According to Abdulaziz Alrashed et al. (2023), a few factors influence the development of T2DM, such as lifestyle habits, physical attributes, and family history.

A study concluded that, as the complication related to T2DM is prolonged and arises, the Quality of Life (QoL) may be reduced because the complication may influence the blood glucose level and insulin resistance, increasing the other risk factors (Zan et al., 2024). Therefore, T2DM can influence the QoL level in many ways, depending on the disease management. According to Bujang et al. (2018), three main domains in QoL that have been used over a decade in assessing the quality of life level in Diabetes patients are"satisfaction," "impact," and "worry."

The body mass index (BMI) classification of underweight, overweight, and obese can affect a person's health and increase the risk of various health problems (WHO, 2010). In a study by Chaib et al. (2023), they reported that half and one-third of the T2DM patients were overweight and obese, respectively. T2DM patients can generally manage and control their blood glucose, adhering to lifestyle

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modifications such as eating low carbohydrates, reducing sugar intake, and doing regular physical activities (Price, 2016). Ghosh et al. (2023) suggested that it is necessary to investigate individual issues regarding adherence to lifestyle changes to achieve effective and efficient treatment goals. Hence, this study aims to determine the effect of perceived adherence to lifestyle changes on QoL, BMI, and blood glucose status.

MATERIALS AND METHODS

Study Design

This study was conducted in the Medical Clinic at Sultan Ahmad Shah Medical Centre (SASMEC@IIUM), Kuantan Pahang. A cross-sectional design was used for this research. Cross-sectional study may provide high efficiency of data collection and lower and control study costs. The convenience sampling method was used as the data collection method.

Study Population

The study population involves patients diagnosed with T2DM who attend the Medical Clinic in SASMEC. The inclusion and exclusion criteria of participants are presented in Table 1.

Table 1: Inclusion and exclusion criteria of the participants.

Inclusion	Exclusion
•T2DM Patients •18 years old and above •Understand the Malay language	•T1DM Patients •Gestational Diabetes Patients •Paediatric Patients

Data Collection

A validated questionnaire was used during the data collection. The questionnaire consists of three sections: Section 1 contains the sociodemographic information, including gender, age, race, BMI, weight, height, and biochemical data. Moreover, the fasting blood glucose (FBG)(mmol/L) and HbA1c (%) levels were collected through i-Pesakit. The researcher also used the weight scale to measure weight and a stadiometer to measure height. The data were collected by interviewing the participants to avoid misunderstanding the questionnaire.

Section 2 contains the Perceived Adherence Level Modification Questionnaire (PALM-Q) to assess perceived adherence levels among T2DM patients (Nor et al., 2022). This questionnaire consists of a total of 18 questions that have four answer options for each question (Strongly Agree, Agree, Disagree, and Strongly Disagree). This questionnaire was developed to determine the factors influencing adherence levels among T2DM to lifestyle modifications. The scoring for this questionnaire is divided into three levels: 1) Perceived non-adherence if the score is 31 and below, 2) Unpredictable perceived adherence if the score recorded is from 32 to 53, and 3) Presumed perceived adherence if the score is 54 and above.

Section 3 of the questionnaire covers the revised version of the Diabetes Quality of Life Questionnaire (DqoL), which has 13 items, which is convenient for patients to answer all questions. Based on the Likert scale, this questionnaire provides five answer options (1: Very satisfied, 2: Moderately satisfied, 3: Neither satisfied nor dissatisfied, 4: Moderately dissatisfied, 5: Very dissatisfied). The higher the score, the poorer will be the QoL.

Statistical Analysis

The sociodemographic data collected were analysed using descriptive statistics by measuring the percentage, mean, and standard deviation (SD) of the sociodemographic results, biochemical results, anthropometry measurements, and level of adherence to lifestyle change. The Independent t-test was used to identify the association between perceived adherence with QoL and body mass index (BMI). The Mann-Whitney U test was used to determine the association of perceived adherence to lifestyle change with blood glucose status. The data obtained were assessed using Statistical Package for the Social Sciences version 20.0 (SPSS 20.0).

RESULTS

Sociodemographic Data

A total of 37 T2DM patients participated in this study. Table 2 shows the sociodemographic data of the selected patients. The researcher interviewed 18 male patients and 19 female patients. The overall age range of the patients is between 40 and 59 years old (48.6%). The majority were Malay patients, with 97% (36) and one Indian (2.7%) patient. The data show that out of 37 patients, only 5.4% (2) fall into the underweight category, normal BMI was 21.6% (8), overweight was 18.9% (7), obese class one was 29.7% (11), obese class two was 10.8% (4), obese class three was 13.5% (5), and the mean BMI among the T2DM patients was 28.2 kg/m^2.

Out of 37 patients, only 35 were assessed regarding adherence to lifestyle changes and blood glucose status because the remaining participants did not have complete blood glucose data in the system. Therefore, among 35

patients, there are 40% (14) among all patients had normal fasting blood glucose readings (<7.0mmol/L), while the other 60% (21) of patients had elevated levels of fasting blood glucose readings (>7.0mmol/L). The mean perceived adherence to lifestyle modification mean score is 56.9±10.72, the overall diabetes QoL mean score is 40.4±12.91, and the mean FBG levels are 8.9mmol/L±3.99, indicating that the average FBG among patients reading is high (>7.0 mmol/L). Looking at each domain under Diabetes Quality of Life (DqoL), the mean scores for satisfaction, worry, and impact domains were 41.5±13.85, 38.8±17.09, and 40.2±20.46, respectively. The descriptive analysis of the PALM-Q shows no patient was categorised as perceived non-adherence. There are 14 totals (37.8%) in unpredictable perceived adherence and 23 (62.2%) in presumed perceived adherence.

Table 2: Sociodemographic data of selected participants

Variables	**Frequency (%)**	**Mean (±SD)**
Gender		
Male	18 (48.6)	
Female	19 (51.4)	
Age (year)		
Young adult (18-21)	1 (2.7)	
Adult (22-39)	3 (8.1)	
Middle Age (40 – 59)	18 (48.6)	
Older adults (≥60)	15 (40.5)	
Weight		73.4 (19.12)
Height		1.6 (1.62)
BMI (kg/m^2)		28.2 (6.51)
Underweight	2 (5.4)	
Normal	8 (21.6)	
Overweight	7 (18.9)	
Obese	20 (54.1)	
Race		
Malay	36 (97.3)	
Indian	1 (2.7)	
FBG		8.9 (3.99)
< 7.0 mmol/L	14 (40)	
≥ 7.0 mmol/L	21 (60)	
PALM-Q (Overall Score)		56.9 (10.72)
Perceived non-adherence	0 (0)	
Unpredictable Perceived Adherence	14 (37.8)	
Presumed perceived adherence	23 (62.2)	
QoL (Overall Score)		40.4 (12.91)
Satisfaction Domain		41.5 (13.85)
Impact Domain		38.8 (17.09)
Worry Domain		40.2 (20.46)

Perceived Adherence To Lifestyle Modification And Quality Of Life

Table 3 indicates that there is a significant difference in the unpredictable perceived adherence (46.9±12.69) and presumed perceived adherence (36.4±11.57) conditions; t (35) = 2.592, p = 0.014. Hence, the QoL scores of patients who scored presumed perceived adherence are lower than those who scored unpredictable perceived adherence.

Perceived Adherence To Lifestyle Modification And Body Mass Index

Table 4 compares perceived adherence levels and participants' body mass index (BMI). From the independent sample t-test, there is no significant difference between the unpredictable perceived adherence (M=27.6, SD=6.70) and presumed perceived adherence (M=28.6, SD=6.51) conditions; t (35) = -1.0375, p = 0.645. Hence, the BMI of patients who scored

Table 3: Comparison of Perceived Adherence to Lifestyle Modification Score and DQoL Score

Variable	Unpredictable Perceived Adherence (n =14)		Presumed Perceived Adherence (n=23)		Mean difference (95% CI)	t-statistics (df)	p-value
	Mean	SD	Mean	SD			
Overall DQoL Score	46.9	12.69	36.4	11.57	10.54 (2.28, 18.79)	2.592 (35)	0.014

presumed perceived adherence was slightly lower than those who scored unpredictable perceived adherence.

Table 4: Comparison of Perceived Adherence to Lifestyle Modification Score and Body Mass Index

Variable	Unpredictable Perceived Adherence (n =14)		Presumed Perceived Adherence (n=23)		Mean difference (95% CI)	t-statistics (df)	p-value
	Mean	SD	Mean	SD			
BMI (kg/m^2)	27.6	6.70	28.6	6.51	-1.0375 (-5.56, 3.49)	-0.465 (35)	0.645

Perceived Adherence To Lifestyle Modification And Fasting Blood Glucose Levels

The mean fasting blood glucose levels among participants who scored unpredictable perceived adherence (mean rank = 21.17, n = 12) were significantly higher than participants who scored presumed perceived adherence (mean rank = 16.35, n = 23) U = 100, z = -1.322 (corrected for ties), p = 0.186, two-tailed. This effect can be described as "small" (r = 0.223), and is illustrated in Figure 2. There is no significant difference between the groups.

DISCUSSIONS

Perceived Adherence to Lifestyle Changes and Quality of Life

Results found a significant difference in diabetes patients' QoL with unpredictable perceived adherence and presumed perceived adherence among T2DM patients. Patients with high perceived adherence scores have lower DQoL scores. Bujang et al. (2018) described that the lower the score of the DQoL, the better adherence to lifestyle modifications.

This result aligned with another related study by Karki et al. (2023), which found that patients with T2DM may improve their overall QoL when complying with lifestyle interventions. A study by Jing et al. (2018) concluded a few factors that could influence the QoL in T2DM patients: physical activity level, frequency of blood glucose check, complications, hypertension, diabetes duration, high red meat diet, and depression.

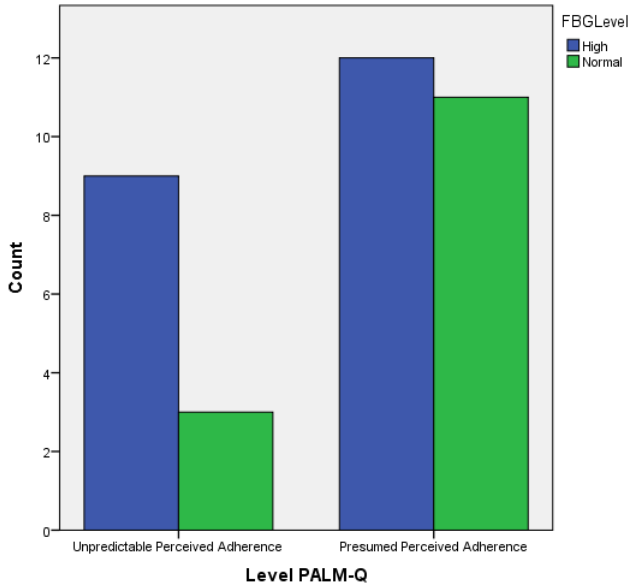

Figure 2: Graph bar for perceived adherence to lifestyle modification score and fasting blood glucose level

The study also found that complications of T2DM, such as physical discomfort and decreased physical activity, also influence QoL in T2DM patients.

According to Nor et al. (2022), the PALM-Q used in this study emphasised the important and exclusive domains of T2DM patients' adherence to lifestyle modifications, such as knowledge, support, practice, motivation and barriers. The revised version of the Diabetes Quality of Life (DQOL) questionnaire has also been improved regarding the influence of other health conditions. A study by (MacDonald et al., 2021) also supports that adherence to lifestyle modification improves overall QoL. Therefore,

adhering to lifestyle modifications recommended by the health care provider is crucial in enhancing the overall QoL of T2DM patients.

Perceived Adherence to Lifestyle Changes with Body Mass Index and Blood Glucose Levels.

The result indicated no significant difference between unpredictable perceived and presumed perceived adherence with BMI among T2DM patients. The study found no association between patients with higher perceived adherence and lower BMI classification. The result contradicts from the research conducted by Burgess et al. (2017) and Düz et al. (2020), who suggested that BMI decreases when the perceived adherence to lifestyle change level increases. Another similar study by Baillot et al. (2015) found that lifestyle modification can improve weight in obese patients.

Patients with higher BMI can have high perceived adherence to lifestyle modification compared to the patients with lower perceived adherence to lifestyle modification because of extrinsic factors such as motivation, awareness and social supports. Therefore, it can be concluded that BMI did not affect perceived adherence to lifestyle modification, and BMI is not an accurate measure of adherence to lifestyle modification among T2DM patients. The factors determining an individual's BMI do not solely depend on adherence to a healthy lifestyle, such as exercising regularly and practising healthy eating habits. Besides, other factors that affect the BMI of patients should be considered; for example, the BMI may be influenced by genetics (Silventoinen & Konttinen, 2020), psychological stress (Delnevo et al., 2021), and metabolic rates (Astrup et al., 1999).

Moreover, no significant difference was found in the current study between perceived adherence to lifestyle changes and blood glucose levels. However, a study by Yang et al. (2016) found the opposite result: high adherence to lifestyle modification has a better-fasting blood glucose status. Similar to pharmaceutical therapy, lifestyle modification has been demonstrated to delay the progression of complications and significantly lower the chance of developing chronic diseases Al-salami et al., 2022). The difference in results may be explained by the reliance on self-reported adherence measures in this study, which are affected by social desirability bias and may not accurately reflect actual behaviour.

CONCLUSIONS

This study highlights the significant impact of perceived adherence to lifestyle changes on the quality of life (QoL) among diabetes patients, underscoring the importance of promoting adherence to improve overall well-being. However, no association was found between perceived adherence, BMI, or blood glucose levels. These outcomes indicate that while lifestyle change adherence may improve the quality of life (QoL), the influence on metabolic outcomes such as BMI and blood glucose is more complex and more likely influenced by other physiological, psychological, medical conditions and environmental factors. Future interventions should aim to address these factors to optimise patient outcomes comprehensively.

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