Original Article

Assessing satisfaction, quality of life, and HbA1c changes in type 1 diabetes patients who are using freestyle libre glucose monitoring

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Abstract

Introduction: Type 1 diabetes mellitus (T1DM) is a chronic auto-immune disease in which loss of pancreatic islet β-cells leads to the deficiency of insulin in the body thus resulting in enhanced blood sugar levels. Effective blood glucose monitoring is crucial in T1DM management to prevent complications, particularly hypoglycemia. **Method:** The study adopted a cross-sectional survey to assess satisfaction and quality of life among T1DM patients using the freestyle libre continuous glucose monitoring (FSL-CGM), and a retrospective cohort study design to evaluate changes in HbA1c over a year. **Result:** The study involved 98 Saudi subjects, with 46.9% ($n = 46$) being male. The results indicated a high level of user satisfaction, with more than 85% of the participants responding positively, yielding a total satisfaction score of 30.86. User satisfaction with FSL-CGM was found to be significantly associated with the level of education. The use of FSL-CGM was also found to significantly improve the patients' quality of life. However, the levels of HbA1c had an impact on both satisfaction and quality of life. Before using the FSL-CGM system, the mean HbA1c was 9.83%, which significantly decreased to 8.63% after using the system (P-value <0.001). **Conclusion:** The study's findings align with previous literature on satisfaction and quality of life, but there are conflicting results regarding the reduction of HbA1c levels using FSL-CGM. Given the limited sample size, future research could explore the topic more comprehensively, potentially utilizing a longitudinal study design to better measure changes in HbA1c level.

Keywords: Diabetes type 1, glucose monitoring, HbA1c, quality of life

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Introduction

Type 1 diabetes mellitus (T1DM) is a chronic auto-immune disease in which loss of pancreatic islet β-cells leads to the deficiency of insulin in the body thus resulting in enhanced blood sugar levels.[1] Its pathogenesis is a continuous process

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that can be divided into different stages including detection of T1DM-associated autoantibodies, destruction of β-cells, dysfunctional regulation of blood sugar known as dysglycemia, and lastly hyperglycemia and its associated symptoms.[2] Diabetes mellitus has increased in prevalence with time as the global diabetes prevalence in 2019 was 9.3% (463 million people).[3] It has increased in 2021 by 1.2% to 536.6 million people with diabetes worldwide.[4] Moreover, the prevalence of type 1 diabetes increasing globally and was 9.5% with an incidence of 15 per 10,000 people worldwide according to meta-analysis published in 2020.[5] In Saudi Arabia, it was estimated that around 7 million people had diabetes in 2016.[6] Furthermore, the incidence rate of T1DM is 33.5 per 100,000 individuals.[7]

Blood glucose monitoring is essential in diabetes management, especially T1DM to prevent complications especially hypoglycemia, helping patients adjust insulin doses based on their blood glucose level.[8] Self-monitoring of blood glucose (SMBG) is a traditional way of blood glucose monitoring by manual finger prick test, but it has some disadvantages like pain, scarring, and loss of sensibility.[9] On the other hand, continuous glucose monitoring (CGM) including flash glucose monitoring (FGM) systems is another new method of blood glucose monitoring that has more advantages in contrast to SMBG as it is easier to use and provides comprehensive data of blood glucose during the day and night.[10] Studies have indicated that the use of CGMS is associated with reduced risk of hypoglycemia and reduced level of A hemoglobin A1C or glycated haemoglobin (HbA1c).[11,12] Studies also have shown that CGMS improves hypoglycemia outcomes even among T1DM patients who have impaired awareness of hypoglycemia.[13]

More recently, a more advanced form of CGMS has been introduced, a freestyle libre flash continuous glucose monitoring system (FSL-CGM) for monitoring interstitial glucose. It was approved by the Food and Drug Administration for use by clinicians in 2016, and for personal use in 2017.[14] FSL-CGM uses wired enzymes, and subcutaneous technology to sense the level of glucose in interstitial fluid.[15] Glucose measurement is taken every minute by the sensor and the reading is recorded at 15-min intervals.[16]

Patient satisfaction and quality of life are among the most important aspects of diabetes management as they ensure the adherence of the patient to the treatment plan and are directly associated with the psychological well-being of the patient.[17] Studies in literature have examined the effect of the CGMS system on patient satisfaction. A qualitative study was conducted to explore CGM satisfaction among adults, youth, and parents of youth and showed that parents of children using CGM reported higher satisfaction. Results also indicated that the use of CGM led to reduced stress related to diabetes, fewer blood glucose monitoring tests, and enhanced quality of life for both children and parents.[18] Findings from the DIAMOND randomized controlled trial on 158 adults reported that adults with T1DM using CGM had lower diabetes-related distress and had high satisfaction as compared to those using traditional methods for glucose monitoring. Moreover, results indicated that patients using CGM were more likely to achieve their target HbA1c level as compared to those using traditional methods; and the satisfaction was associated with a reduction in diabetes distress, increased hypoglycemic confidence, reduced hypoglycemic fear, and enhanced well-being.[19] Another study conducted on 30 adults with T1DM indicated that CGM improves the quality of life of patients by improving the quality of sleep and reducing the number of episodes of hypoglycemia.[20]

Our study aims to explore the satisfaction, quality of life, and changes in HbA1c levels of T1DM patients who are using FSL-CGM.

Method

This study followed a cross-sectional survey research design to assess the satisfaction and quality of life of T1DM patients using FSL-CGM and a retrospective cohort study design to assess change in their level of HbA1c over the period of one year. Details of study participants, measures used in the study, and procedure followed are described below. IRB approval optioned in 03 - July - 2022.

Participants

Participants were recruited from the outpatient clinic at the University Diabetes Center, King Saud University Medical City, Riyadh, Saudi Arabia. The sample size of the study was determined using the Krejcie Morgan sample size formula. Participants in the study were recruited based on the following inclusion criteria. Participants failing to meet the inclusion criteria were excluded from the study.

Inclusion criteria

The inclusion criteria for study participants are as follows:

- Participants with diagnosed T1DM.
- Participants with an age range of above 14 years.
- Participants use freestyle libre as their blood glucose monitoring system.

Measures

The questionnaire used in the study was preceded by a consent form and demographic questionnaire to draw information about the demographics of participants. Demographic information of the participant included the age of the participant, occupation of the participant, nationality, gender, education level, duration of usage of freestyle libre, HbA1c before, and six months after using FSL-CGM, recent HbA1c, presence of comorbidities (hypertension and dyslipidemia) and presence of diabetes complication.

Diabetes-dependent quality of life

This scale consists of overall two items. One item measures the overall quality of life of a person while the other measures the

quality of life in 19 different aspects of life. These 19 domains in which quality of life is measured include working life, holidays, leisure activities, family life, close personal relationships, local or long-distance journeys, physical appearance, physical health, motivation to achieve things, sex life, friendships, social life, self-confidence, financial situation, feelings about the future, dependence on others, people's reactions, living conditions, freedom to drink, and freedom to eat. Participants are asked to evaluate each of these 19 domains if they did not have diabetes. The rating of the participant on the scale is divided into impact rating and importance rating. Rating on a −3 to +1 scale for each domain constitutes impact rating and rating on a scale from 0 to +3 constitutes importance rating. For scoring on each domain, a weighted score is calculated by identifying a multiplier of impact rating and importance rating. The weighted score on each domain usually ranges from −9 to +3. A low score on the domain indicates poor quality of life. Lastly, the average impact score on all domains is taken to determine the overall quality of life of a patient.[21]

Diabetes Treatment Satisfaction Questionnaire

The Diabetes Treatment Satisfaction Questionnaire (DTSQ) tool is an effective tool to measure treatment satisfaction among T1DM. The scale consists of a total of eight items. Six items measure the satisfaction of the patient with treatment (usage of freestyle libre) and two items measure the perceived frequency of hypoglycemia and hyperglycemia. The response on the scale is measured on a Likert-type scale ranging from 0 to 6. The total score of the scale is calculated by summing the scores on the items.[22]

Procedure

The proposal for the research was approved by the Institutional Review Board. After approval of the research, data were collected with the informed consent of participants through a questionnaire. For informed consent, participants were debriefed about the purpose of the study and its probable outcomes and implications at the start of the questionnaire. All the questionnaires were administered at the same time and the order of the questionnaire was the same for all participants. Recorded responses were then analyzed according to the hypothesis of the study.

Results

The total population of the study was 98 Saudi subjects of which 46.9% (n = 46) were males. The mean age of the participants was 26.8 ± 7.6 years, with a mean BMI of 26.29 kg/m^2. About 45.9% of the study subjects are employed, 1% are retired, 18.4% are unemployed, and 34.7% are students. As for the education level, more than half of the participants had a bachelor's degree and only a few of them were in primary and intermediate school. The average duration since being diagnosed with type 1 diabetes was 11.56 ± 7.5 years and the mean duration of continuous glucose monitoring usage was 15.05 ± 9.30 months. The mean of HbA1c prior to starting CGM was 9.83 ± 2.09%. As for the medications, 88.7% of the patients were on multiple daily injections, and 11.3% were on mixed insulin. About 11.2% of the study subjects had hypertension, and 25.5% had dyslipidemia. The most common complications were diabetic retinopathy accounting for 17.3%, followed by diabetic neuropathy and nephropathy each accounting for 7.1%, followed by peripheral vascular disease 6.1%, coronary artery disease 4.1%, and finally, cerebrovascular disease accounting for 2% [Table 1]. HbA1c decreased by around 1% after using FGM which was statistically significant [Figure 1].

Table 2 shows the results of the DTSQ. When asking participants about their satisfaction after using FGM, 86.73% responded positively with a total satisfaction score of 30.86.

The highest satisfaction score was for management recommendation followed by knowledge satisfaction. Around

Table 1: Demographic factors of T1DM patients who are using freestyle libre-continuous glucose monitoring duration of spontaneous glucose monitoring usage and HbA1c before and after freestyle libre usage, types of medication and complications

Demographic factors	Result
Gender, *n* (%)	
Male	46 (46.9)
Female	52 (53.1)
Age (mean, SD)	26.82±7.68
DM duration (mean, SD)	11.56±7.58
BMI (mean, SD)	26.29±6.14
Job, *n* (%)	
Employee	45 (45.9)
Retired	1 (1.0)
Not working	18 (18.4)
Student	34 (34.7)
Education level, *n* (%)	
Primary	3 (3.1)
Intermediate	
Secondary	2 (2.0)
Diploma	28 (28.6)
University	3 (3.1)
Postgraduate	57 (58.2)
CGM usage duration (months) (mean, SD)	15.05±9.30
HbA1c before (mean, SD)	9.83±2.09
Recent HbA1c (mean, SD)	8.32±1.66
Type of medication (mixed, MDI PUMP), *n* (%)	
MDI	86 (88.7)
Mixed	11 (11.3)
HTN, *n* (%)	11 (11.2)
DLP, *n* (%)	25 (25.5)
Diabetic neuropathy, *n* (%)	7 (7.1)
Diabetic nephropathy, *n* (%)	7 (7.1)
Diabetic retinopathy, *n* (%)	17 (17.3)
CAD, *n* (%)	4 (4.1)
Cerebrovascular disease, *n* (%)	2 (2.0)
PVD, *n* (%)	6 (6.1)

BMI=Body mass index; CAD=Coronary artery disease; CGM=Continuous glucose monitoring; DLP=Dyslipidemia; DM=Diabetes mellitus; HTN=Hypertension; MDI=Multiple-dose injection; PVD=Peripheral venous disease; SGM=Spontaneous glucose monitoring

Table 2: Diabetes Treatment Satisfaction Questionnaire results—as assessed by patients

	Scores*				Percent of patients with positive answers**
	Mean	SD	Median	Interquartile range	
Satisfaction	4.95	1.25	5	2	86.73
Perceived frequency of hyperglycemia	2.72	1.84	2	3	31.63
Perceived frequency of hypoglycemia	2.64	1.77	3	3	32.65
Suitability	4.98	1.22	5	2	88.78
Flexibility	5.11	1.28	6	1	88.78
Knowledge satisfaction	5.21	1.09	6	1	95.92
Management recommendation	5.42	1.14	6	1	92.86
Continuity	5.19	1.33	6	1	90.82
Total score of satisfaction	30.86	5.68			

*Values are expressed as means, standard deviation and median (interquartile range). **Positive answers: range 4–6 in DTSQ (patient scored each item on a scale ranging from 0 "very dissatisfied/inconvenient" to 6 "very satisfied/convenient"); the total score was calculated as the sum of the scores for items 1, 4, 5–8

Table 3: Overall quality of life of T1DM patients using freestyle libre continuous glucose monitoring

	Number	%
In general, my present quality of life is		
Mean	5.22	
Standard deviation	1.475	
Median	5	
Q1, Q3	4, 6	
If I did not have diabetes, my quality of life would be		
Mean	3.24	
Standard deviation	1.104	
Median	3	
Q1, Q3	2, 4	
In general, my present quality of life is		
Excellent (+3)	22	22.4
Very good (+2)	27	27.6
Good (+1)	20	20.4
Neither good nor bad (0)	15	15.3
Bad (−1)	8	8.2
Very bad (−2)	6	6.1
If I did not have diabetes, my quality of life would be		
Very much better (−3)	11	11.2
Much better (−2)	36	36.7
A little better (−1)	22	22.4
The same (0)	24	24.5
Worse (1)	5	5.1

68% had a less perceived frequency of hyperglycemia and hypoglycemia. In general, 70.4% of participants had positive quality of life with a mean overall quality of life score of 5.22 ± 1.475 [Table 3].

The average weighted impact was 1.37. Motivation showed the greatest negative impact on the quality of life of all domains followed by journeys and personal relationships [Table 4].

Educational level showed a significant relation with satisfaction (*P* value = 0.016) as having an intermediate school education or a diploma had the highest total satisfaction score [Table 5].

Otherwise, no significant relation was found between satisfaction and other patients' characteristics. Moreover, there was a

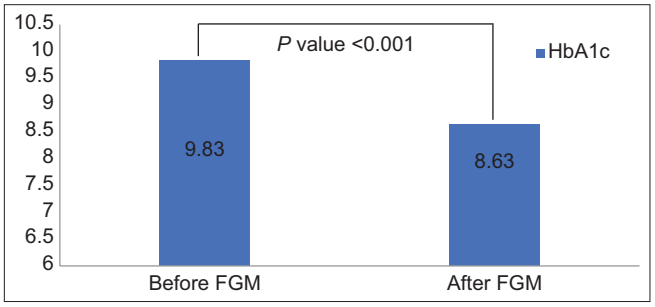

Figure 1: Hemoglobin A1c (HbA1c) before and after using free style libre glucose monitoring . *Significant at *P*-value <0.05. FGM = fasting glucose monitoring

significant negative correlation between HbA1c before libre usage and total satisfaction score ($r = -0.278$, P value = 0.006) and between recent HbA1c and total satisfaction score ($r = -0.226$, P value = 0.025) [Table 6].

Table 7 showed no significant relation between the average weighted impact score and patients' characteristics.

However, higher recent HbA1c was associated with a significantly higher average weighted impact score ($r = 0.308$, P value = 0.002) [Table 8].

Reliability of the questionnaires

The Cronbach's alpha for the DTSQ and the audit of diabetes-dependent quality of life (ADDQoL) questionnaire were 0.867 and 0.930, respectively, which reflect very good and excellent reliability.

Discussion

Management of diabetes is considered comprehensive if, in addition to clinical outcomes such as HbA1c levels, outcomes relative to the experience of the patient including quality of life, satisfaction, and well-being are also included in the management. These parameters have a direct influence on patient adherence to treatment and diabetes care.[23] In this study, we aimed to explore the patient's experience, satisfaction, and quality of life, while using the FSL-CGM system in addition to measuring its effect

Table 4: Patients' responses to the Romanian version of the audit of diabetes-dependent quality of life (ADDQoL-19)

Specific life domain	Impacting rating		Importance rating		Weighted impact score	
	Mean	SD	Mean	SD	Mean	SD
Leisure	−1.12	1.02	1.97	0.72	−2.06	2.24
Work	−0.83	1.03	2.38	0.67	−2.03	2.75
Journeys	−1.18	0.95	1.65	0.72	−1.69	1.76
Holidays	−1.12	0.99	1.95	0.64	−2.12	2.16
Physical	−1.00	1.01	1.89	0.67	−1.72	1.99
Family life	−1.33	1.02	2.50	0.56	−3.31	2.70
Friendships and social life	−1.30	1.00	2.18	0.66	−2.79	2.48
Personal relationship	−0.97	0.96	1.88	0.71	−1.50	1.77
Sex life	−0.92	1.07	1.88	0.67	−1.32	2.02
Physical appearance	−1.14	1.10	2.05	0.71	−2.27	2.48
Self-confidence	−1.32	1.00	2.46	0.58	−3.28	2.74
Motivation	−1.38	1.00	0.94	0.64	−1.09	1.36
Reactions of other people	−1.07	1.03	1.62	0.94	−1.39	1.98
Feelings about the future	−0.73	1.02	2.01	0.74	−1.27	2.22
Financial situation	−1.33	0.92	2.24	0.69	−2.86	2.32
Living conditions	−1.27	0.95	2.22	0.67	−2.74	2.29
Depend on others	−1.19	0.99	2.17	0.96	−2.46	2.49
Freedom to eat	−0.32	0.96	2.03	0.74	−0.38	1.98
Freedom to drink	−0.42	1.00	2.04	0.81	−0.48	2.10
Average weighted impact					−1.99	1.37

Table 5: Total score of satisfaction by patients' characteristics

	Mean	SD	*P*
Gender			
Male	30.15	6.45	0.720
Female	31.21	5.16	
Age			
<25 years	30.20	7.19	0.356
25–45 years	31.45	4.00	
>45 years	26.67	6.03	
Job			
Employee	31.36	4.58	0.697
Retired	26.00		
Not working	30.50	6.46	
Student	30.12	6.90	
Education level			
Primary	23.67	10.07	**0.016***
Intermediate	36.00	0.00	
Secondary	29.68	6.75	
Diploma	36.00	0.00	
University	31.32	4.94	
Postgraduate	28.60	4.83	
Type of medication mixed MDI pump			
MDI	30.44	6.04	0.303
Mixed	32.36	3.01	
HTN			
Yes	31.00	5.95	0.863
No	30.68	5.81	
DLP			
Yes	31.00	5.95	0.863
No	30.68	5.81	
Diabetic neuropathy			
Yes	31.14	2.67	0.840
No	30.68	5.97	
Diabetic nephropathy			
Yes	29.86	5.76	0.687
No	30.78	5.82	
Diabetic retinopathy			
Yes	30.65	4.91	0.598
No	30.73	5.99	
CAD			
Yes	31.25	4.27	0.851
No	30.69	5.87	
Cerevro-vascular disease			
Yes	28.00	2.83	0.506
No	30.77	5.83	
PVD			
Yes	31.17	3.49	0.845
No	30.68	5.92	

***Significant *P*<0.05**. CAD=Coronary artery disease DLP=Dyslipidemia; HTN=Hypertension; MDI=Multiple-dose injection; PVD=Peripheral venous disease

on the patient's HbA1c. The results of our study indicated that there was high user satisfaction and more than 85% of the sample responded positively with a total satisfaction score of 30.86. User satisfaction with FSL-GCM was significantly associated with the level of education. Results also reported that the use of FSL-GCM significantly improved the quality of life of patients. However, levels of HbA1c affect both satisfaction and quality of life. It was negatively correlated with satisfaction and positively associated with a negative impact on quality of life.

The results of the study are aligned with the previous literature. A prospective study was conducted in Saudi Arabia in which participants with T1DM using the traditional finger-pricking method were recruited in the study. FSL sensor was administered and after 12 weeks, satisfaction and well-being of the participant were measured. Results of the study indicated that there was a statistically significant improvement in satisfaction and well-being scores among patients who were using FSL. Patients using multiple-dose injections (MDI) showed greater improvement than participants who were using insulin pumps. The results of the study also reported that there was a significant reduction in the perceived frequency of hyperglycemia.[24] Another study conducted on Japanese adults with T1DM and T2DM reported similar findings. The results of the study indicated that after 14 days of use of FSL, there was a significant increase in satisfaction as measured by DTSQ and well-being as measured by the WHO-5 index for the patients with T1DM. However, in contrast to the study by Mitsuishi *et al*.,[25] there was no difference in the perceived frequency of hyperglycemia after 14 days. However, the satisfaction score of the patients was much higher.[25] This is in accordance with the results of our study where patients reported high satisfaction scores but moderate scores on the perceived frequency of hyperglycemia. Other studies conducted on children and adolescents have also reported similar results. There was higher satisfaction among children after 14 days of the use of the FSL, and there was a

Table 6: Correlations between total satisfaction and age, continuous glucose monitoring usage duration, HbA1c before and HbA1c after

	$r^{\#}$
Age	0.074
Continuous glucose monitoring usage duration	0.058
HbA1c before	−0.278**
DM duration	0.123
BMI	0.125
Recent HbA1c	−0.226*

*Correlation is significant at the 0.05 level (two-tailed). **Correlation is significant at the 0.01 level (two-tailed). #Pearson correlation coefficient. BMI=body mass index; DM=diabetes mellitus

Table 7: Average weighted impact by patients' characteristics

	Mean	SD	*P*
Gender			
Male	−2.05	1.34	0.773
Female	−1.94	1.40	
Age			
<25 years	−2.03	1.45	0.698
25–45 years	−1.99	1.33	
>45 years	−1.40	0.82	
Job			
Employee	−1.96	1.38	0.662
Retired	−0.72		
Not working	−2.31	1.29	
Student	−1.90	1.42	
Education level			
Primary	−1.63	1.24	0.391
Intermediate	−2.43	0.88	
Secondary	−1.74	1.34	
Diploma	−2.99	0.22	
University	−2.13	1.45	
Postgraduate	−1.26	0.77	
Type of medication mixed MDI pump			
MDI	−1.96	1.37	0.795
Mixed	−2.08	1.43	
HTN			
Yes	−1.97	1.47	0.863
No	−1.99	1.37	
DLP			
Yes	−1.97	1.47	0.154
No	−1.99	1.37	
Diabetic neuropathy			
Yes	−1.65	1.49	0.274
No	−2.10	1.32	
Diabetic nephropathy			
Yes	−1.44	1.83	0.183
No	−2.03	1.33	
Diabetic retinopathy			
Yes	−1.54	1.45	0.141
No	−2.08	1.34	
CAD			
Yes	−1.37	1.62	0.359
No	−2.02	1.36	
Cerevro-vascular disease			
Yes	−0.36	0.51	0.089
No	−2.02	1.36	
PVD			
Yes	−1.04	1.53	0.079
No	−2.05	1.34	

CAD=Coronary artery disease DLP=Dyslipidemia; HTN=Hypertension; MDI=Multiple-dose injection; PVD=Peripheral venous disease

good correlation with the SBGM.[26] The higher user satisfaction with FSL is primarily associated with the absence of an alarm system and the simplicity of the system. This encourages higher user compliance, which has been observed in several studies.[27] Poor glycemic outcomes even after the use of FSL have been associated with poor adherence to the management system and lowered use of the sensor.[28]

With respect to the level of HbA1c and FSL, our study reported that there was a significant reduction in HbA1c levels. However, a study conducted on pregnant women with T1DM indicated that although women reported high satisfaction after wearing the sensor and monitoring the glucose level, there was no difference in the HbA1c level of women using FSL and the conventional finger pricking method.[1] A randomized controlled trial was conducted to measure the efficacy of FSL and CGM among patients with T1DM and impaired awareness of hypoglycemia. Results of the study indicated that both groups experienced improved HbA1c outcomes. However, improvement in hypoglycemia fear and reduction in hypoglycemia exposure was reported in the CGM group. It has been reported that CGM is better than FSL for patients with T1DM using MDI and have Hb1Ac levels above the target value and individuals dealing with hypoglycemia. This is mainly because of the impact of alarms and alerts on the behaviors of humans.[29] However, other studies have reported that appropriate adherence to the use of FSL can result in a significant reduction in HbA1c levels while also mitigating other diabetes-related complications. This reduction in HbA1c is primarily due to continuous monitoring and control.[30]

As mentioned above, HbA1c should not be the only factor deciding the efficacy of the treatment but other factors which significantly impact the treatment quality should also be considered including the well-being of a patient and quality of life.[31] Enhanced treatment satisfaction and quality of life of patients usually play a crucial role in the self-efficacy of patients and commitment of patient of patients which ultimately assist long-term glycemic control thus minimizing the risk of diabetes complications in the long run.[23] The results of the study reported that the use of FSL significantly enhanced the quality of life of T1DM patients. Such blood glucose monitoring systems can influence the quality of life of the patient as they allow the patient to gain a sense of control over their blood sugar level and at a broader level, control of their diabetes. Results of the study indicated that the impact on quality was not moderated by patient characteristics including age, gender, job, and education level of the patient. The results are supported by previous literature which indicates that improvement in the quality of life of patients including reduced diabetes distress and enhanced glycemic confidence after using CGM is consistent

Table 8: Correlations between average weighted impact and age, continuous glucose monitoring usage duration, HbA1c before and HbA1c after

	$r^{\#}$	*P*
Age	0.047	0.647
Continuous glucose monitoring usage duration/months	−0.178	0.082
HbA1c before	−0.102	0.319
DM duration	0.099	0.333
BMI	0.039	0.704
Recent HbA1c	0.308**	**0.002**

**Correlation is significant at the 0.01 level (two-tailed). #Pearson's correlation coefficient. BMI=Body mass index; DM=Diabetes mellitus

across participants and is not affected by the scores of the participants at the baseline.[30]

Conclusion

The continuous glucose monitoring system using subcutaneous interstitial fluid to report the level of glucose provides closeness to the vasculature and is usually minimally invasive. FSL-GCM also uses a sensor inserted in the back of the arm of the patient to provide glucose monitoring. This study was conducted to explore satisfaction, quality of life, and HbA1c level of the patients who were using FSL-GCM. Results of the study reported that FSL-GCM has a significant impact on the quality of life of patients with T1DM, significantly reduces their HbA1c level, and has high user satisfaction. However, previous studies report that FSL-GCM does have higher user satisfaction and a significant impact on the quality of life of the patient, but there is contradictory literature on the reduction of HbA1c level using FSL-GCM. Future research can explore the topic more in-depth as the study has a limited sample size and changes in HbA1c levels can be measured more effectively in a longitudinal study design.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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