

Enhancing Type 2 Diabetes Management through Patient-Centric Pharmacist Counselling: A Comprehensive Study

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ABSTRACT

Introduction: Patient counselling has been shown to significantly enhance lifestyle modifications and medication adherence in the management of non-communicable diseases. **Research Design and Methods:** A single-centre, prospective, randomized, controlled, interventional study was conducted at a leading tertiary care hospital in Sri Lanka to investigate the impact of pharmacist-led patient counselling on Knowledge, Attitude and Practice (KAP) based lifestyle changes and treatment in Type 2 Diabetic Mellitus (T2DM). Baseline KAP scores were initially assessed via a comprehensive questionnaire administered to all participants. Subsequently, only the test group received targeted counselling from a pharmacist, complemented by a detailed educational leaflet. **Results:** After 2 months, a follow-up assessment revealed a significant increase in the test group's mean KAP score from 39.11±5.82 to 49.02±3.39 ($p=0.00$; $p<0.05$), indicating the effectiveness of the intervention. Furthermore, there was a marked improvement in the test group's average Fasting Blood Sugar (FBS) levels, which decreased from 147.58±43.30 mg/dL to 134.13±40.02 mg/dL. A positive correlation was observed between baseline knowledge and educational level ($p=0.012$), underscoring the role of education in disease management. However, no significant changes were noted in Body Mass Index (BMI) in either group ($p>0.05$). **Conclusion:** This study demonstrates that enhancing KAP through patient counselling can positively influence the overall management of T2DM.

Keywords: Patient Counselling, Knowledge, Attitude, Practice, Type 2 DM.

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INTRODUCTION

Non-Communicable Diseases (NCD) have taken priority over communicable diseases and a higher rate of morbidity and premature mortality are recorded worldwide. They are medical conditions or diseases that are, by definition, non-infectious and non-transmissible between people.^{1,2} The Majority of the NCD burden occurs in low and middle-income countries,³ and 25% is in individuals younger than 60. NCDs are the leading cause of death and kill 41 million people each year, equivalent to 71% of all deaths globally. Sustainable Development Goal (SDG) 3.4 states: "By 2030, reduce premature mortality from NCDs by one-third through prevention and treatment"⁴

Diabetes Mellitus (DM) is a metabolic disease characterized by chronic hyperglycemia resulting from defects in insulin secretion,

insulin action, or both.^{5,6} It leads to severe complications if unmanaged, including strokes, neuropathy, macrovascular complications, peripheral vascular disease, coronary artery disease and retinopathy, leading to other NCDs and reduced life expectancy. DM is ranked the seventh leading cause of blindness, renal failure and lower limb amputation and a leading cause of cardiovascular death, which is predicted to increase beyond 642 million people widely.⁷ International Diabetes Federation (IDF) estimates that, in 2021, 537 million people have diabetes, which is projected to reach 643 million by 2030 and 783 million by 2045.

According to the statistics, it has clearly shown that Sri Lanka has a higher number of diagnosed and undiagnosed patients with DM. There has been an over 300% increase in diabetes prevalence since the late 1980s to 2005 in Sri Lanka.⁸ An increasing trend of fatalities due to DM during the period between 2001 and 2010 was seen, particularly among individuals aged 30-70. Recent studies revealed that Sri Lanka has very high diabetes prevalence, significantly higher than current global estimates for any other Asian country, making it a burning health problem.⁹ Urban



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residency and familial inheritance appear to be important factors associated with DM in Sri Lanka.¹⁰

The risk factors associated with most non-communicable diseases, including DM, are largely preventable. There is no curable treatment for NCDs and they can only be controlled. However, it has been estimated that 95% of NCD management is performed outside of medical settings, thereby improving knowledge, attitudes and practices about the disease, which is paramount. Optimizing therapy in patients with DM is considered a critical task and needs considerable patient education and motivation. It is shown that counseling and follow-up programs that lead to a healthy lifestyle are crucial in reducing the risk factors associated with NCDs, including DM. Hence, patient counselling is a vital aspect of pharmaceutical care, aiming to optimise medication use, increase patient satisfaction and adherence, shorten treatment durations, minimize side effects, reduce overall healthcare costs and ensure the best therapeutic outcomes. The ultimate objective is to improve glycemic control without inducing hypoglycemia or unwanted weight gain while maintaining or improving blood pressure and lipid profiles.

Medication noncompliance occurs when the patient is not obeying recommendations as prescribed by the healthcare provider. Research indicates that long-term therapy compliance rates hover between 40% and 50%, whereas short-term therapy adherence is significantly higher, at 70% to 80%. Notably, adherence to lifestyle modifications remains the lowest, at 20% to 30%.¹¹

Enhancing patient education is the most effective strategy to bolster medication adherence, enriching patients' Knowledge, Attitudes and Practices (KAP) regarding disease management. In Sri Lanka, the majority of Type 2 Diabetes Mellitus (T2DM) patients rely on government hospital clinics.¹² However, due to high patient volumes, healthcare professionals, including pharmacists, often cannot dedicate individual attention to each patient's Knowledge, Attitudes and Practices (KAPs) on the disease and its management. This lack of attention and resulting information deficit finally led to poor control of DM and patients will often receive more and more medications to control their blood sugar levels. However, the underlying cause for the therapeutic failure may be the wrong pattern of medicine usage or lack of lifestyle modifications.

This study seeks to assess the medication management of T2DM by improving the knowledge, attitude and practice of patients regarding the disease and medicine consumption through structured counselling sessions. Initial KAP levels were gauged via questionnaire, with subsequent reassessments post-counseling. Changes in Fasting Blood Sugar (FBS) levels and Body Mass Index (BMI) maintenance were monitored as indicators of the intervention's success.

RESEARCH DESIGN AND METHODS

Study settings and Study population

A single-centre, prospective interventional study was conducted at the University Hospital- KDU, Werahera-Sri Lanka. The study included a diverse cohort of 124 patients (sample size was calculated based on the total number of registered patients at the diabetes clinic), aged 20 to 79, who had managed their condition with oral hypoglycaemic drugs for at least four months. Patients who did not meet the above selection criteria, those with gestational DM or T1DM, or who are solely under insulin therapy and patients with cognitive, hearing, or vision impairment were excluded from the study. These selected participants were randomly assigned into control and test groups, with 62 individuals each (see Figure 1). To ensure comparability, the similarity of KAP scores and demographic data of both groups were confirmed at the baseline by a pre-test using a predesigned questionnaire validated by a pilot study. The questionnaire incorporated the 8-item Morisky Medication Adherence Scale (MMAS) and the 4-item Morisky Green and Levine Medication Adherence Scale (MGLS), both of which were adapted to fit the cultural context of Sri Lanka.

Data Collection

The questionnaire consisted of 2 sections: the 1st section evaluated patient demographic data, while the second section assessed the patient's Knowledge, Attitude and Practice (KAP) level. The knowledge section includes the evaluation of understanding the disease condition, medicines used and basic laboratory tests used to monitor the prognosis. In contrast, the attitude section includes information gathering on smoking and alcohol consumption, diet plans and exercise. The practice section mainly concentrated on evaluating medicine consumption patterns.

Counselling Session

The counselling session was held for approximately 5-10 min, providing comprehensive guidance on essential aspects of diabetes management under the guidance of the clinical pharmacologist and a consultant physician according to a counselling guideline available in "Action on Diabetes," chapter 6, in the IDF Diabetes Atlas Ninth edition 2019. 4 months after the baseline assessment, a post-test on KAP was conducted for both the test and control groups to evaluate the effectiveness of the counselling intervention. At the end of the project, both groups were educated by having a joint counselling session on lifestyle changes in managing T2DM. Ethical approval was obtained from the Ethical Review Committee (ERC), Faculty of Medicines, General Sir John Kotelawala Defence University.

Statistical Analysis

Data analysis was performed using IBM Statistical Package for the Social Sciences, version 23 (IBM SPSS V23), considering

Table 1: Demographic data and the composition of Test and Control Groups at the baseline.

Educational level	Never attended school	9(7.3%)	
	Primary school level and below	28(22.6%)	
	Up to secondary education	82(66.1)	
	Graduates and above	5(4%)	
DM family history	Present	80(64.5%)	
	Absent	44(35.5%)	
BMI	Normal weight (18.5-24.9)	57(46%)	
	Overweight (25.0-29.9)	48(38.7%)	
	Obese (≥ 30)	17(13.7%)	
	Underweight (< 18.5)	2(1.6%)	
Duration of diabetes	Below 1 year	16(12.9%)	
	1-5 year	32(25.8%)	
	5-9 year	27(21.8%)	
	Above 10 years	49(39.5%)	
Composition of Test and Control Groups		Test (<i>n</i> =62)	Control (<i>n</i> =62)
Sex	Male	41.93%	43.54%
	Female	58.06%	56.45%
Race	Sinhala	96.76%	96.76%
	Tamil	1.62%	1.62%
	Muslim	1.62%	1.62%
	Burgher	-	-
	Malay	-	-
Age	20-39	3.22%	8.06%
	40-59	40.32%	38.7%
	60-79	56.46%	53.22%

the normality and significance level as 0.05 (at 95% confidence interval).

RESULTS

A total study population of 124 individuals completed the questionnaire at the baseline. However, during the four-month study, 20 patients (16.13%) withdrew, resulting in 104 patients completing the study. Demographic details such as age, sex, education level and duration of Diabetes Mellitus (DM) are detailed in Table 1. Among the participants, 71 (57.3%) were female, 53 (42.7%) were male and a majority of 54.8% fell within the age bracket of 60-79 years.

In examining the duration of Diabetes Mellitus (DM) from diagnosis, 39.5% of participants had been living with DM for over a decade, underscoring the chronic nature of the disease. The disease duration fell between 5-9 years for 21.8% of participants and between 1-5 years for 25.8%. A smaller fraction, 12.9%, had been diagnosed with Type 2 Diabetes Mellitus (T2DM) within the past year. The majority of study participants, (66.1%) had

attained an education up to the secondary level, while 7.3% had no formal education. A significant proportion, 64.5%, reported a family history of DM, suggesting a genetic predisposition. 46% of participants' Body Mass Index (BMI) fell within the normal range, whereas 38.7% were classified as overweight and 13.7% as obese (Table 1).

Awareness of diabetes management was notably lacking among participants in both the test and control groups. In particular, 45.16% of the control group and 54.83% of the test group were not informed about the names of their medications, while 59.67% and 54.83%, respectively, were unaware of the strength of the medicines they used. Additionally, many subjects were unfamiliar with the normal ranges for Fasting Blood Sugar (FBS) levels and the importance of the HbA_{1c} test. 80.84% of individuals in the control group and 74.19% in the test group did not recognise the significance of the HbA_{1c} test (Table 2).

Within both the test and control groups, negative attitudes toward T2DM management were prevalent (Table 3). Notably, there was a lack of recognition regarding the crucial role of exercise

and physical activity in managing T2DM effectively. Regarding dietary practices (See Table 3), 67.74% of the control group and 58.06% of the test group participants had not maintained a healthy diet. This pattern extended to carbohydrate consumption, with an identical percentage from both groups neglecting a low-carbohydrate diet. Moreover, many participants were not informed about the benefits of a low-calorie diet, with 69.35% of the control group and 83.87% of the test group remaining unaware. Despite this lack of comprehensive knowledge about T2DM management, both groups exhibited positive attitudes toward smoking and alcohol intake.

A minority of participants reported skipping medications in the two weeks preceding the survey. However, there were instances of dosage mismanagement; 18 (29.03%) individuals from the control group and 17 (27.41%) from the test group admitted to doubling their dose after a missed one. Additionally, 31 (50%) of the control group and 24 (38.70%) of the test group held the misconception that it is beneficial to increase medication dosage following a high-sugar meal or to discontinue medications when blood sugar levels normalize. Despite these misunderstandings, the majority of patients in both groups were aware of the potential risks associated with ceasing medication without consulting a physician (See Table 4).

In summary, most participants in the test group demonstrated an average understanding of the disease, with knowledge scores at 72.58% and attitudes toward the disease at 79.03%. A minority showed limited knowledge (8.06%) and less favourable attitudes (4.83%). Notably, a significant portion excelled in the practice questions, scoring 62.90%. Similarly, the control group participants achieved average knowledge (74.19%), attitude (74.19%) and practice 53.22% (See Table 5).

After participating in counselling sessions, the test group significantly improved their test scores. Many participants achieved high scores across all three domains: knowledge (90.38%), attitude (63.46%) and practice (75%). When compared to the baseline, there was a substantial enhancement in knowledge and attitude scores. In contrast, the control group did not improve significantly compared to the baseline. The intervention group's mean KAP scores were significantly higher than the control groups, highlighting the effectiveness of counselling sessions. Participants' knowledge scores improved from 22.58% in the baseline study to 46.15% in the intervention group. Importantly, no participants fell into the low-score range for knowledge and practice.

Additionally, the baseline and post-intervention changes in Knowledge, Attitude and Practice (KAP) scores for both test and control groups were assessed. Initially, the mean KAP scores for the test and control groups were closely matched (Mean=39.11±5.823 and Mean=40.34±5.510, respectively), indicating no significant difference in overall KAP. This was

Table 2: Baseline knowledge on the disease medications and the clinical tests regarding T2DM.

Knowledge assessed	Control group n=62	Test Group n=62
	Number (%)	Number (%)
Lack of awareness about the disease.	58 (93.54%)	52 (83.87%)
Lack of awareness about the names of medicines used.	28 (45.16%)	34 (54.83%)
Unawareness about the strength of medicines.	37 (59.67%)	34 (54.83%)
Lack of awareness about the normal FBS level.	44 (70.96%)	36 (58.06%)
Taking high doses of medicines after a heavy sugar meal.	31 (50%)	24 (38.70%)
Stop taking diabetes medicines when sugar level is under control.	26 (41.93%)	23 (37.09%)
Stop taking medicines without doctors' advice	9 (14.5%)	4 (6.45%)
Lack of awareness about the HbA1c test.	50 (80.64%)	46 (74.19%)

corroborated by the independent sample t-test, which yielded a significant value of $p=0.231$ ($p>0.05$). After the intervention, the results revealed that the mean value of the test group (49.02) exceeded that of the control group (42.50).

Initially, the mean Fasting Blood Sugar (FBS) values for both the control (148.06) and test group (147.58) were approximately similar. However, after the counseling session, the mean FBS value of the test group significantly decreased to 134.13, while the mean FBS value of the control group also decreased to 143.85. Although the improvement in the control group was not as pronounced as in the test group, the intervention's efficacy in physiological outcomes is evident. The BMI weight status of the test group patients did not show a significant difference ($n=5$, 9.61%) over the two months, even after the intervention program. It's important to note that a two-month period may not be sufficient to produce a noticeable change in BMI weight status.

Moreover, the effectiveness of the counselling session was evaluated using section 3 of the questionnaire by test group patients. Out of all the patients in the test group, 51.9% reported that they benefited from the counselling sessions in maintaining normal blood glucose levels (See Table 6). 42.3% of participants stated that the counselling sessions helped them modify their food habits, while 71.1% of participants mentioned that it encouraged them to exercise regularly. 72.03% of participants emphasized the need for these counselling sessions, particularly for managing

Table 3: Baseline attitudes on dietary habits and other related factors regarding T2DM.

Attitude assessed	Control group n=62	Test group n=62
	Number (%)	Number (%)
Not following a healthy diet.	42 (67.74%)	36 (58.06%)
Not believing importance of regular exercises.	62 (100%)	62 (100%)
Not adhering into low carb diet.	49 (79.03%)	49 (79.03%)
Not adhering into low fat diet.	46 (74.19%)	50 (80.64%)
Not concerning about low calorie intake.	43 (69.35%)	52 (83.87%)
not satisfied with maintaining healthy diet plan.	35 (56.45%)	33 (53.22%)
Smoking	8 (12.90%)	2 (3.22%)
Consumption of alcohol.	12 (19.35%)	13 (20.96%)

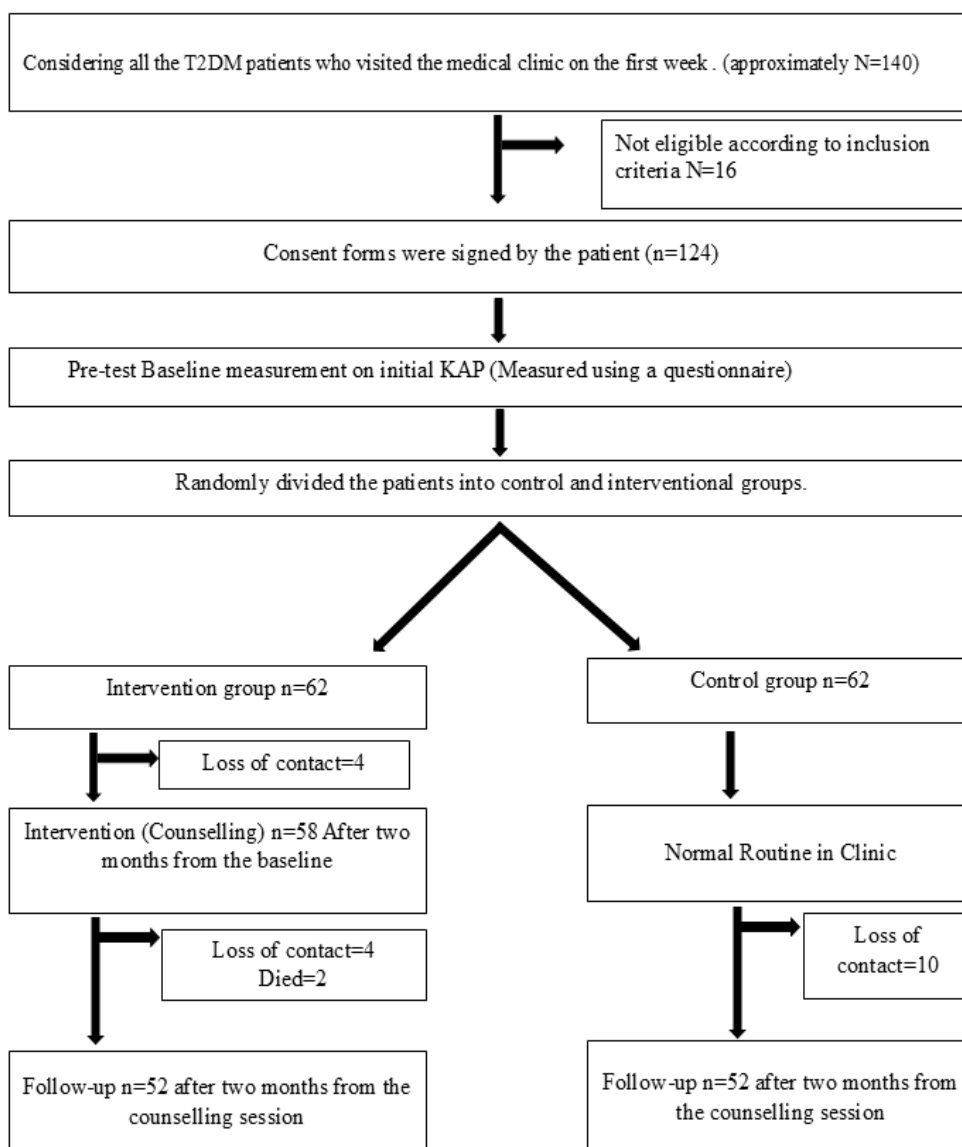


Figure 1: Flow diagram showing the study design and recruitment of participants.

Table 4: Baseline practices on drug consumption/medication management on DM.

Practices assessed	Control Group <i>n</i> =62	Test Group <i>n</i> =62
	Number (%)	Number (%)
Omitting medicines during the last two weeks of time.	23 (37.09%)	19 (30.64%)
Having doubled dose after a missed dose of a drug.	18 (29.03%)	17 (27.41%)
Forgetting to take medicines.	34 (54.83%)	22 (35.48%)
Not adhering to the treatment plan.	32 (51.61%)	18 (29.03%)
Forgetting to bring medicines while travelling.	27 (43.54%)	27 (43.54%)

Table 5: Group Statistics for Total KAP Post-test score of control and test groups with the change in individual Knowledge, Attitudes and Practices.

Scores	Group		Mean	Std. Deviation	Std. Error Mean
Total KAP test score	Test Group	pre	39.11	5.823	.739
		post	49.02	3.393	.470
	Control Group	pre	40.34	5.510	.700
		post	42.50	4.461	.619
			Low	Average	High
Knowledge	Test Group	pre	5 (8.06%)	45 (72.58%)	12 (19.35%)
		post	0 (0%)	5 (9.61%)	47 (90.38%)
	Control Group	pre	2 (3.22%)	46 (74.19%)	14 (22.58%)
		post	0 (0%)	28 (53.84%)	24 (46.15%)
Attitude	Test Group	pre	3 (4.83%)	49 (79.03%)	10 (16.12%)
		post	0 (0%)	19 (36.53%)	33 (63.46%)
	Control Group	pre	2 (3.22%)	46 (74.19%)	14 (22.58%)
		post	1 (1.92%)	36 (69.23%)	15 (28.84%)
Practice	Test Group	pre	4 (6.45%)	19 (30.64%)	39 (62.90%)
		post	1 (1.92%)	12 (23.07%)	39 (75%)
	Control Group	pre	1 (1.61%)	28 (53.84%)	33 (53.22%)
		post	0 (0%)	22 (42.3%)	30 (57.69%)

non-communicable diseases. An overwhelming 90.04% of patients strongly agreed they required more counselling sessions. Participant feedback consistently highlighted the benefits of counselling sessions, including improved blood glucose levels, dietary habits and exercise routines. Furthermore, a significant proportion expressed a desire for continued counselling sessions, highlighting the importance of ongoing support in managing chronic conditions like T2DM see Table 6.

DISCUSSION

Diabetes is a complex and challenging disease that requires self-management decisions made by the patient.^{13,14} A combination of non-pharmacological approaches would have an important effect on managing T2DM compared to medication alone. As integral members of the healthcare team, pharmacists play a pivotal role in providing essential counselling sessions to patients with various medical conditions. This comprehensive approach

Table 6: Summary of the evaluation of the counselling session.

Evaluation of Counselling	Response
Having advantages by maintain normal blood glucose level.	51.9%
Encouraging to change food habits.	42.3%
Encouraging to do regular exercises.	71.1%
Requirement of more counselling sessions regarding other non- communicable diseases.	72.03%
Requirement of more counselling sessions regarding T2DM.	90.04%

ensures patients receive accurate information and support to manage their health effectively. Our current study delves into the effects of pharmacist-led interventions on patient counselling, revealing significant improvements in patients' Knowledge, Attitudes and Practices (KAP). This enhancement is particularly notable in lifestyle modifications that are crucial for the management of T2DM. The study highlights that pharmacist-led intervention, which include personalized medication counselling, dietary recommendations and exercise guidance, substantially elevate patients' understanding and proactive engagement in their treatment regimens. These interventions empower patients to make informed decisions, fostering a positive attitude towards their health and encouraging the consistent practice of healthy behaviours. Furthermore, our research underscores the critical role of Diabetes Self-Management Education (DSME) in achieving optimal diabetes management. DSME provides patients with the skills and confidence needed to manage their condition effectively on a daily basis, reducing the risk of complications and improving overall quality of life. The study's findings emphasize that incorporating DSME into routine care is essential for equipping patients with the necessary tools to navigate their diabetes journey successfully.^{15,16}

According to the results, the intervention group demonstrated significant KAP advancements in contrast to the control group's minimal progress. This difference highlights the impact of targeted interventions and the necessity of customized strategies in diabetes management, as advocated. The findings align with similar previous research conducted in India where knowledge improvement positively impacted attitude and practice, enhancing glycemic control.¹⁷ That study revealed a significant decrease in mean HbA1c levels in the post-intervention phase after the counselling. In another study conducted in Jordan, Knowledge scores improved from 16.03 to 21.36 in post-intervention, while Attitude scores increased from 2.74 to 4.40.¹⁸ Both studies recommended personalized interventions that account for socio-demographic factors and health literacy, which are essential for promoting positive behavioural changes in T2DM patients. The current study findings divulged a significant improvement

in knowledge, attitude, practice and fasting blood sugar levels in the intervention group compared to the control group. These results might be due to the effective counselling techniques employed, which included creating a comfortable environment for patients, providing tailored solutions to their medication and disease-related issues, engaging in active listening, utilizing open-ended questions to foster dialogue, outlining beneficial dietary plans, promoting healthy behaviours and offering genuine empathy. Additionally, comprehensive support was extended to help patients overcome negative perceptions and misconceptions about medications. At the same time, printed information leaflets were given to all the patients who belonged to the test group. Most patients' heightened attention and cooperation during the sessions could be linked to their typically brief interactions with medical practitioners and a general hesitance to discuss health concerns during clinical visits.

A positive attitude towards disease is crucial for adopting and maintaining effective medication management, engaging in self-care practices, reducing stress related to the condition and fostering improved self-esteem and a healthier outlook. Medication adherence can be characterized as the degree to which the patients take medications as endorsed by healthcare providers.^{19,20} Non-adherence to medication regimens can manifest in various forms, from skipping doses to taking medications at incorrect times or dosages and in some cases, exceeding the prescribed amount. To improve medication management, it is essential to provide clear information to patients, including details on what, how and when to take medicines, as well as the reasons behind medication use, dosing frequency and duration. According to the study findings, general practices regarding the use of medicines were good in both groups. Education and continuous support from healthcare professionals are pivotal in reinforcing these attitudes and practices, leading to improved glycemic control and a better quality of life for individuals with diabetes. Moreover, the long-term sustainability of interventions remains a critical aspect of diabetic self-care.¹³ It emphasized the need for continuous support and reinforcement of healthy behaviours to sustain positive results. This resonates with responses obtained in the current study, where most participants desire additional counselling sessions, emphasizing the ongoing need for support and guidance.

CONCLUSION

Counseling focused on the medication management of Type 2 Diabetes Mellitus (T2DM) has shown significant positive impacts on the Knowledge, Attitude and Practice (KAP) of participating patients. By enhancing patient understanding and engagement in their treatment plans, such counselling has the potential to lead to improved health outcomes and better disease management. However, a major challenge lies in the disproportion between the

high number of patients and the limited number of pharmacists with the necessary counselling expertise. This imbalance often results in insufficient patient education and support.

Despite these challenges, implementing patient-centric counselling sessions holds promise in mitigating the long-term complications associated with T2DM. Through tailored counselling, patients can receive personalized guidance on medication adherence, lifestyle modifications and managing co-morbid conditions, collectively contributing to a more comprehensive approach to diabetes care. Furthermore, these sessions allow patients to voice their concerns and receive real-time feedback, fostering a more collaborative patient-pharmacist relationship.

Investment in training and expanding the pharmacist workforce, alongside integrating technology-based solutions such as telehealth, can help bridge the gap in counselling services. Ensuring that patients have consistent access to qualified counselling can significantly improve the quality of life for those managing T2DM, potentially reducing hospitalizations and healthcare costs associated with poorly managed diabetes.

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CONSENT TO PARTICIPATE

Written informed consent was obtained from the study participants.

ETHICAL CONSIDERATIONS

Ethical approval (Ethical approval No: RP/S/2020/38) was obtained from the Ethical Review Committee (ERC) of the Faculty of Medicines, General Sir John Kotelawala Defence University. A collaborative partnership was maintained with UH-KDU-Werahara after getting permission from the Director of the UH-KDU and the Consultants of the Medical Clinic and the hospital staff.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

ABBREVIATIONS

UH-KDU: University Hospital, Kotelawala Defence University; **ERC:** Ethical Review Committee; **DM:** Diabetes Mellitus; **T1DM:** Type 1 Diabetic Mellitus; **T2DM:** Type 2 Diabetic Mellitus; **KAP:** Knowledge, Attitude and Practice; **DSME:** Diabetes Self-Management Education; **FBS:** Fasting Blood Sugar; **BMI:** Body Mass Index; **NCD:** Non-communicable diseases; **SDG:** Sustainable Development Goal; **IDF:** International Diabetes Federation; **MMAS:** Morisky Medication Adherence Scale; **MGLS:** Morisky Green and Levine Medication Adherence Scale; **IBM-SPSS:** IBM Statistical Package for the Social Sciences.

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