Innovations

Self-Care Management Program on Glycemic Control And Level of Depression among Adolescence with Type I Diabetes : A Pilot Study

O.Selvarajan[1]✉, Dr.R.Kannan[2]✉, Dr.A.Helen.M.Perdita[3]✉, Kannan Uma Soundari[4]✉

[1]Saveetha College of Nursing, Saveetha Institute of Medical and Technical Sciences, Chennai, TamilnaduIndia
ORCID ID: 0000-0003-1668-8228
[2]Saveetha University, Chennai, Tamilnadu, India
ORCID ID:0000-0003-3536-6515
[3]Apollo College of Nursing, Madurai, Tamilnadu, India
ORCID ID:0000-0002-2114-6813
[4]Saveetha University, Chennai, Tamilnadu, India
ORCID ID: 0009-0008-9963-8181

Corresponding Author:O.Selvarajan

Abstract

Background: Adolescence is a delicate stage of human development that typically lasts from puberty to maturity. It is a time of change for both physical and psychological growth. India has more than 235 million young people, and China has 225 million. In India nowadays, adolescence (10–19 years old) make up about one in every five people, or about one in six people worldwide. *Aim: to study the effectiveness of diabetic self-care management program on glycemic control, Self-insulin administration and level of depression among adolescence with type I diabetes.* *Objectives: To assess the level of glycemic control,Self-insulin administration and level of depression among adolescents with type I diabetic in the EG and CG.* *Methods: The glycemic control evaluated through HbA1C level, Insulin administration knowledge assessed through Self structured questionnaireand WHO Wellbeing scale for depression used for assessed depression. The selected intervention samples are received self-care management training like insulin administration demonstration and collected 24 hours diet history and calculate the nutrient volume and advised appropriate nutrition for samples and training for active exercise for physical activity and Yoga & meditation and also, given self-care management training through lecturing, video teaching and information booklet for every Sunday for 12 weeks. First Post test was conducted on 13 week and second*

post test was conducted after 25 weeks. **Interpretation:***EG showed a significant improvement comparing the glycemic level before and after the intervention (p<001). Both the EG and CG post-test mean score showed a significant difference (p<001).* **Conclusion***: Diabetic self-care management program used in the study effectively reduced glycemic level, improved self-insulin administration technique and also relieved from depression among adolescence with type I diabetes.*

Key words: *Adolescence, Diabetic self-care management program, Type -I diabetes, Glycemic control, psychological parameters.*

1.Introduction

Latin for "to mature," adolescere, is the root of the word adolescence. Adolescence is a delicate stage of human development that typically lasts from puberty to maturity. It is a time of change for both physical and psychological growth. Adolescents develop their capacity for abstract thought during this time, which eventually leads to the development of long-term plans and goals. Every youngster develops differently and may have a distinct perspective on the world. It is crucial to emphasize that while the developmental plasticity during adolescence renders adolescents adaptable, it does not imply passivity. Adolescents actively participate in shaping their own development. Nevertheless, they require guidance and support, including conducive environments that enhance their prospects for positive growth as they engage in exploration, experimentation, and learning. An adverse environment hinders adolescents from experiencing normal development. The transformations occurring in their bodies, brains, and behaviors throughout adolescence dynamically interact with each other and the surrounding environment, collectively influencing the various pathways to adulthood.

A chronic metabolic condition known as T1D is characterised by the problematic symptoms for which the human body cannot be able to produce insulin. It frequently appears in childhood or adolescence, necessitating lifelong management, and if properly handled, can result in catastrophic consequences. Adolescents with T1D face unique challenges in managing their condition, as they juggle the complexities of adolescence while also managing their diabetes. One of the critical aspects of T1D management is self-care, which encompasses various lifestyle changes, BGL and many more.The review also found that DSME programs were more effective when they were delivered in a group setting and when they were tailored to the individual needs of the participants. Another study, published in the journal Diabetes Care in 2020, found that DSME programs were effective in reducing the risk of death by all causes in people with type 2 diabetes. Participants who received DSME education were 18% less likely to die from any cause during the study period. DSME programs are particularly beneficial for people with newly diagnosed diabetes. A 2018 study found that people with newly diagnosed type 2 diabetes who received DSME education

were more likely to achieve their blood sugar and blood pressure goals than those who did not receive DSME education.

Increasing glycaemic control has been demonstrated to prevent both microvascular and macrovascular events, and hyperglycemia is a key predictor of the emergence of diabetes late complications [1,2]. The level of blood glucose is influenced by a variety of internal and environmental factors, but it is generally agreed that effective self-care helps people with type 1 diabetes avoid complications and that they must actively manage their condition to have the best blood glucose results. Important psychosocial factors like sadness and emotional distress have been linked to a number of studies that show they can have a negative effect on glycemic control by interfering with self-care habits. DSMC programs can be challenging for adolescents with T1D, as they require a significant commitment of time and effort. Adolescents may also be reluctant to participate in DSMC programs if they feel self-conscious about their diabetes or if they perceive the programs as being too restrictive. There are a number of ways to overcome the challenges of DSMC programs for adolescents with T1D. One important step is to make sure that the programs are tailored to the needs and interests of adolescents. DSMC programs should be engaging and interactive, and they should allow adolescents to learn at their own pace. Another important step is to provide adolescents with support and encouragement during their participation in DSMC programs. Parents, healthcare providers, and other caregivers can play a vital role in supporting adolescents with T1D as they participate in DSMC programs.

Adolescents with poorer glycemic control are more likely to experience depression, and vice versa. There are a number of possible reasons for this association. One possibility is that the stress of managing type 1 diabetes can led to depression. This can be a lot to manage, especially for adolescents who are already experiencing the challenges of puberty and adolescence. Another possibility is that depression can make it more difficult to manage type 1 diabetes. Glycemic control and level of depression among adolescence with type I diabetes are closely related. Adolescents with type I diabetes have a two to three times greater prevalence of depression than youth without diabetes.

There are a number of reasons why adolescents with type I diabetes may be at increased risk for depression. First, managing type I diabetes can be challenging and demanding, especially during adolescence. This can be difficult, especially during a time of life when many adolescents are striving for independence. Second, adolescents with type I may feel isolated and different from their peers. They may be self-conscious about their diabetes and the need to manage it. They may also feel like they are missing out on activities that their peers are able to enjoy and that's why it is below 7.5% [3]. This can be a source of anxiety and stress, which can contribute to depression.

In order to achieve optimal glycemic control, patients must adhere to a nutritious diet, frequent physical exercise, BST, foot care, and medication

regimen as part of their diabetes self-care behaviours. Adherence to self-care behaviours is complicated and difficult, particularly for patients who are struggling financially and may not be able to purchase diabetes supplies like testing strips for metres, prescriptions, or healthy diets, which can prevent them from achieving optimal glycemic control. Glycemic control, measured by glycated hemoglobin (HbA1c) levels, is a critical determinant of long-term health outcomes in individuals with T1D. Poor glycemic control can lead to complications. Adolescents, in particular, are at risk of suboptimal glycemic control due to the challenges of managing their condition during a period of significant physical, emotional, and social development. Successful self-care behaviours necessitate patients making every day, perhaps challenging lifestyle changes. T2DM self-care behaviours were reported to be poorly adhered to both domestically and internationally. One of the six essential components of the CCM to enhance diabetes control in primary care settings is self-management assistance. The importance of self-care management is supported by the results of numerous research, which show that better glycemic control is predicted by greater adherence to each self-care behaviour, including exercise, dieting, BST, and medication adherence.[4]

One in every 300 people have type 1 diabetes, an autoimmune condition that is on the rise in terms of new diagnoses. By 2030, it is expected that 550 million people worldwide will have diabetes, and that figure will continue to grow.[5]

One in every 400 to 600 youngsters worldwide has type 1 diabetes (T1D). Every three to six years, the prevalence and incidence of it both rise by roughly 2% to 5% globally. In Iran, one out of every 500 teenagers is thought to develop T1D. Controlling diabetes demands lifelong rigorous self-care behaviours, and they are what are required for self-care.[6]

Particularly eating disorders, anxiety, and depression are more common in young people with T1D. Psychosocial problems and psychiatric diseases are frequently associated with impaired glucose regulation, a higher incidence of diabetic ketoacidosis, and can impair the effectiveness and adherence of treatment in T1D.The mean HbA1c levels decreased by a clinically meaningful amount, indicating better glucose management among adolescents who received the program. The intervention group also showed a reduction in depression scores, suggesting that the self-care management program had a positive impact on the participants' mental health. Adolescents reported lower levels of depressive symptoms after completing the program. Adherence to self-care practices, including insulin management, dietary choices, and physical activity, improved significantly in the intervention group. Adolescents became more engaged in their diabetes management, leading to better outcomes.[7]

Teenagers with T1DM struggle socially, feeling different from their peers or unable to fit in with them, which causes them to be more anxious. T1DM-affected teenage patients' glycemic control, blood sugar levels, and quality of life

can all be significantly impacted by the emotional stress they encounter. Teenagers must therefore learn to better cope with this time and manage their diabetes.[8]

Non-genetic factors including alterations in the environment and lifestyle, such as the dramatic increase in obesity, inappropriate newborn feeding practises, and a drop in infection rates, are contributing to an increase in the prevalence of T1D globally. T1D is estimated to impact around 3% of the population annually. T1D is estimated to affect more than 1,110,100 children and teens between the ages of 0 and 19, and each year, 128,900 persons get a new diagnosis.[9]

Need For Study

The prevalence of T1D is rising internationally as a result of non-genetic causes like as changes in the environment and lifestyle, such as the sharp rise in obesity, improper neonatal feeding practises, and a decline in infection rates. About 3% of the population is thought to be affected by T1D each year. Between 0 and 19 years old, T1D is expected to impact more than 1,110,100 kids and teens, and each year, 128,900 people receive a new diagnosis.[10]

Particularly eating disorders, anxiety, and depression are more common in young people with type 1 diabetes. Psychosocial problems and psychiatric diseases are frequently associated with impaired glucose regulation, a higher incidence of diabetic ketoacidosis, and can impair the effectiveness and adherence of treatment in T1D.Adolescents have unique needs, and effective self-care management programs must be tailored to address their developmental stage and psychosocial challenges. Engaging adolescents in their care and providing age-appropriate resources are essential components of successful interventions. [17]

There are 15900 new cases in India are files[11]. Most South-East Asian teenagers with T1DM are from India, according to the IDF. Every year, our nation reports an average of three new cases of T1DM per 100,000 adolescents aged 0 to 14.[12]

Three sets of data indicate that there are 10.2 instances per 100,000 children in Karnal (Haryana),17.93 cases per 100,000 children in Chennai, and 3.2 cases per 100,000 children in Karnataka[13].

Researches on the effectiveness of diabetic self-care management program on glycaemic control and psychological parameter outcomeamong adolescence are very sparse. Hence this study is aimed at the effectiveness of diabetic self-care management program on glycaemic control, self-insulin administration and level of depression among adolescence with type 1 diabetic in diabetic OPD, GRH at Madurai.

2. Method
2.1. Design
The subjects who fulfill the inclusion criteria were selected as a participant. Probability simple random sampling to assign the participants either to control or to EG. The intervention group subject was received the diabetic self-care management program through lecturing, demonstration, video and booklets. Control group subject was received regular treatment.

Setting and participant
The study was conducted at the Diabetic Outpatient department, Govt. Rajaji Hospital, Madurai, Tamilnadu, India, in the time of period 01/2023 to 06/2023. Adolescence with type I diabetes those who were age between 12 – 18 years receiving the regular insulin injection from setting they were separated two group like intervention group and control group through simple random method.

Ethical considerations: The applicable rules of research ethics were all upheld. The appropriate authority gave its assent to the study protocol. After providing participants with information regarding their right to participate, decline, or withdraw at any time, participants' formal consent to participate was obtained. All collected information was kept completely private. There are no negative impacts on the youngsters who participated in the study due to the questionnaire.

Material & Methods
After optioned informed consent from participant and care giver, the pretest socio demographic variable like age, sex, religion, education qualification of Father and Mother, Income, occupation of parents and clinical variable like duration of illness, Numbers previous admission in hospital, Hypoglycemic episodes, then HbA1C level, and, Insulin administration knowledge assessed through Self structured questionnaire and WHO Wellbeing scale used for assessed depression. After that intervention given to EGupto12 weeks every Sunday at 8 am 10 am. The intervention based on Insulin administration demonstration, Knowledge regarding Type I diabetics through lecturer method diet plan modification and physical and yoga exercise hands on training given. After completion of intervention Post test -I was conducted by using the same toolboth intervention group and control grouppost-test. Then 25-week Post test – II was conducted both intervention group and control group.

Hba1c Analysis, Table, Graph And Interpretation

Sl. No		Group comparisons	Statistics
Table 1: Comparison of control and EGs on glycosylatedhaemoglobin in type 1 diabetics.			
1		Significance among groups (Control/Experimental)	F = 9.972 P = 0.005
		Significance in the tests (Pre-test/Post-test 1/Post-test 2)	F = 18.532 P < 0.001
		Significance in interactions (Group/test)	F = 24.342 P < 0.001
2	Control and Experimental	Significance of Pre-test	t = 0.125 P = 0.902
		Significance of Post-test 1	t = 3.795 P < 0.001
		Significance of Post-test 2	t = 4.747 P < 0.001
3	Significance within Control	Pre-test and Post-test 1	t = 0.158 P = 1.0
		Pre-test and Post-test 2	t = 0.789 P = 1.0
		Post-test 1 and Post-test 2	t = 0.631 P = 1.0
4	Significance within Experimental	Pre-test and Post-test 1	t = 7.261 P < 0.001
		Pre-test and Post-test 2	t = 8.555 P < 0.001
		Post-test 1 and Post-test 2	t = 1.294 P = 0.611

Table 1: shows the between group comparisons, Control and Experimental Pre-test did not show significance (P = 0.902). The between group comparisons, Control and Experimental Post-test 1 showed significance (P < 0.001).

The between-group comparisons between the Control and EGs at Post-test 2 demonstrated statistical significance (P < 0.001). However, the within-group comparisons within the Control group, including Pre-test and Post-test 1, 2, and Post-test 1 and 2, did not yield significant results (P = 1.0 for all). Notably, the within-group comparison within the EG between Post-test 1 and 2 did not reveal statistical significance (P = 0.611). These results indicate that the Control group did not experience an improvement in HbA1C levels. However, the EG exhibited

a significant 2.71% decrease in HbA1C levels from the Pre-test to Post-test 2, highlighting the beneficial impact of the intervention.
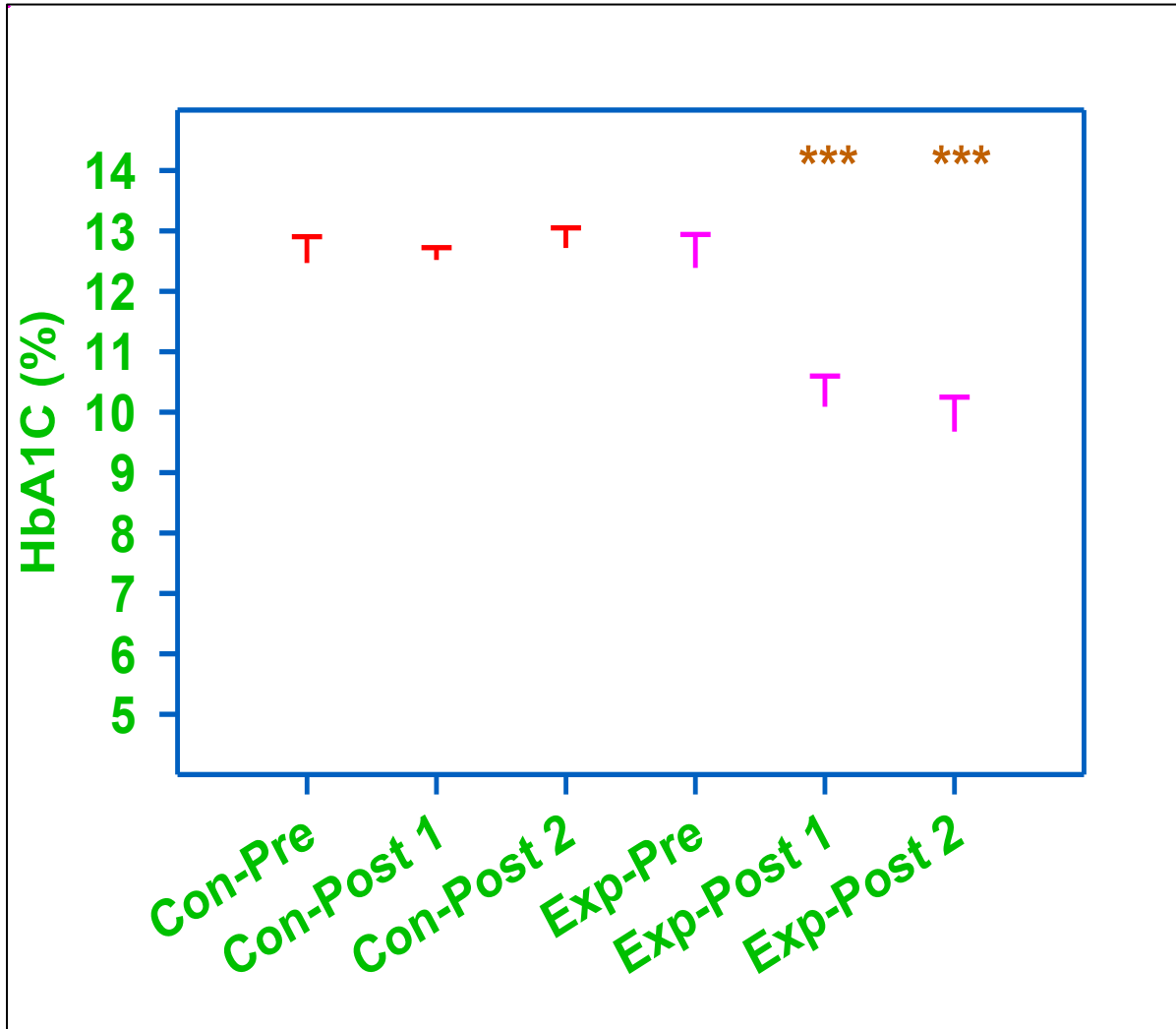
Graph 1: Comparison of the Mean and SEM of HbA1C

The above figure represents theComparison of that the mean and SEM of glycosylated haemoglobin (HbA1C) of control and EGs of type 1 diabetics. The mean of HbA1C of Control group Pre-test, Post-test 1 2 are 12.47, 12.52 and 12.72 (%), respectively. The mean of HbA1C of EG Pre-test, Post-test 1 and are 12.39, 10.09 and 9.68 (%), respectively. Two-way RM ANOVA with Boneferroni 't' test showed statistical significance among overall group comparisons (P = 0.005).

Orit Pinhas-Hamiel et al[14] assessed a retrospective study on Trajectories of HbA1C Levels in Children and Youth with Type 1 Diabetes, Israel. The sample consists of 349 patients. Consecutive sampling technique was used in this study. The data were collected by HbA1C levels. The results show the modelled curves created using quantile regression and the crude percentiles of HbA1C as a function of age and gender exhibited good agreement. The charts demonstrate a decrease in HbA1C levels at each percentile from 2 to 4 years of age. After then, there is a slow rise during the years leading up to puberty, with a peak between the ages of 12 and 14. After that, HbA1C levels drop to their lowest

levels in the third decade. Male and female curves followed each other closely, with females' HbA1C levels in the 25th, 50th, and 75th percentiles being around 0.1% (1.1 mmol/mol) higher. The study concluded that HbA1C level distribution curves for T1DM patients that are age-specific.

Table 2:	Comparison of control and EGs on insulin administration.		
Sl. No	Groups comparisons	Test comparisons	GROUP COMPARISONS
1		One Way ANOVA on Ranks	H = 42.914 P < 0.001
2	Control and Experimental	Significance between Pre-test	q = 1.639 P = 0.857
		Significance between Post-test 1	q = 5.704 P < 0.001
		Significance between Post-test 2	• q = 4.807 • P = 0.009
3	Significance within Control	Pre-test and Post-test 1	• q = 0.607 • P = 0.998
		Pre-test and Post-test 2	• q = 0.326 • P = 1.0
		Post-test 1 and Post-test 2	• q = 0.281 • P = 1.0
4	Significance within Experimental	Pre-test and Post-test 1	• q = 6.736 • P < 0.001
		Pre-test and Post-test 2	• q = 6.120 • P < 0.001
		Post-test 1 and Post-test 2	• q = 0.616 • P = 0.998

Table 2 demonstrates that the between-group comparisons between the Control and EGs at Post-test 2 exhibited statistical significance (P = 0.009). However, the within-group comparisons within the Control group, encompassing Pre-test and Post-test 1, 2, as well as Post-test 1 and 2, did not yield significant results (P = 0.998, 1.0, and 1.0, respectively). In contrast, the within-group comparisons within the EG, specifically between Pre-test and Post-test 1 (P < 0.001) and Pre-test and Post-test 2 (P < 0.001), showed significant improvements. In contrast, the EG demonstrated a notable increase of 4 points from Pre-test to Post-test 2, indicating the beneficial impact of the intervention.
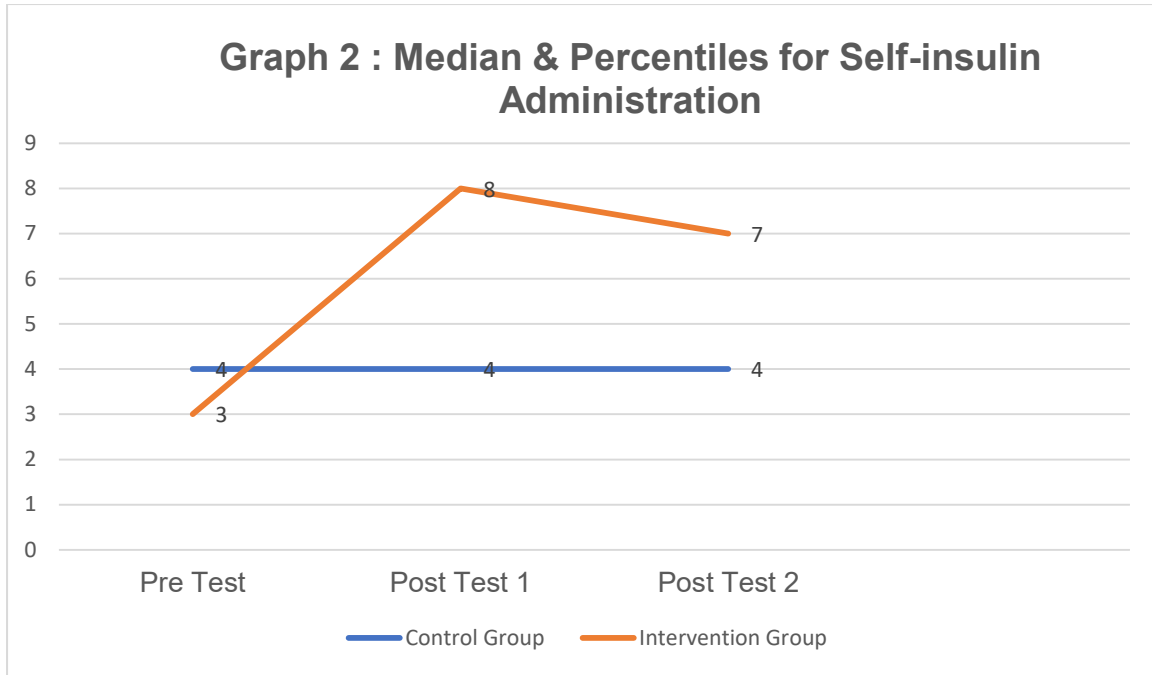
Graph 2 : The above line graphsthe median and percentiles of self-insulin administration of control and EGs of type 1 diabetics.The median of insulin administration (score) of Control group Pre-test, Post-test 1 and Post-test 2 are 4, 4 and 4, respectively. The median of insulin administration (score) of EG Pre-test, Post-test 1 and Post-test 2 are 3, 8 and 7, respectively. ANOVA on ranks showed statistical significance among overall comparisons (P < 0.001).

Cecyli.C, A. Atchaya and P. Aravindhan[15]conducted the sample which consists of 100 diabetics. Convenient sampling technique was used in this study. The data were collected by self-structured questionnaire. In order to administer insulin, (82%) people had not regularly changed the skin site. 75%, did not dispose of their spent syringes or needles in a safety box. 68% of people who used insulin had not checked the expiration date. In terms of self-care practice on administration, only two demographic factors—education and residence—had statistically significant correlations (p 0.001 level, respectively). The study concluded that to identify areas where teaching has to be strengthened, it is still vital to assess how patients use them.

Sl. No		Group comparisons	Test comparisons	Statistics
Table 3: Comparison of control and EGs on WHO wellbeing scale for level of depression in type 1 diabetics.				
1		Significance among groups (Control/Experimental)		F = 19.866 P = <0.001
		Significance in the tests (Pre-test/Post-test 1/Post-test 2)		F = 30.468 P = <0.001
		Significance in interactions (Group/test)		F = 17.045 P = <0.001
2	Control and	Significance between Pre-test		t = 1.135

	Experimental		P = 0.266
		Significance between Post-test 1	t = 5.430 P = <0.001
		Significance between Post-test 2	t = 5.187 P = <0.001
3	Significance within Control	Pre-test and Post-test 1	t = 1.387 P = 0.522
		Pre-test and Post-test 2	t = 0.971 P = 1.000
		Post-test 1 and Post-test 2	t = 0.416 P = 1.000
4	Significance within Experimental	Pre-test and Post-test 1	t = 8.737 P = <0.001
		Pre-test and Post-test 2	t = 7.904 P = <0.001
		Post-test 1 and Post-test 2	t = 0.832 P = 1.000

Aurora James-Palmer et al [16] conducted a sample which consists of 27 studies. Random sampling technique was used in this study. The data were collected by scientific databases. The results show However, 70% of the studies overall demonstrated gains. Intervention parameters varied widely among research, suggesting various factors that may affect intervention efficacy. 58% of studies evaluating anxiety and depression indicated improvements in both symptoms, while 25% only showed improvements in anxiety. In addition, 40% of trials focusing solely on depression revealed improvements, while 70% of studies measuring anxiety alone demonstrated improvements.

Conclusion: Children frequently use medical services. Children with diabetes require different care than adults. The Type I diabetic kids wanted to understand their condition and how insulin works. They also needed to be competent self-administrators of insulin injections to get around any obstacles and maintain good glycemic control. To live, children constantly require extra care. The study's findings demonstrated that a diabetic self-care management programme for type 1 diabetes mellitus enhances glycemic control and self-administration of insulin injections, which consequently lowers the level of depression. DSMC programs can also reduce depression symptoms in adolescents with T1D by providing them with support and education about the relationship between diabetes and mental health. Adolescents who participate in DSMC programs learn coping skills to manage stress and anxiety, and they are encouraged to seek professional help if they are experiencing depression. However, it's essential to recognize that diabetes management is a lifelong journey, and ongoing support and education are critical for sustained success.

Rajaji hospital in Madurai can improve their glycemic control, self-administer insulin, and lower their level of depression by using the diabetic self-care management programme. In order for children and family members to understand self-administration practices better, health care professionals must take the initiative to guide, educate, and inform teenagers about them in appealing ways.

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