



## A Study to Assess The Effectiveness of Nursing interventions On Treatment compliance and Clinical Outcomes among Clients With Type 2 Diabetes Mellitus in Selected Hospital at Puducherry

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### ABSTRACT

*Diabetes mellitus is an emerging global endocrine health problem in the health care system, in which India ranks the second most affected regions after China in South- East Asia. The aim of the present study was to assess the effectiveness of nursing interventions on treatment compliance and clinical outcomes among clients with type 2 diabetes mellitus in selected hospital at Puducherry. Clients with type 2 diabetes mellitus aged between 40 and 70 years from Aarupadai Veedu Medical College & Hospital, Puducherry were selected and were divided into the experimental group (n = 30) who had a resistant exercise and the control group (n = 30) received the routine treatment for a trial of 30 days. A pretest and posttest quasi experimental research design was adopted. Demographic variables, health profile, knowledge on diabetes mellitus, and clinical outcomes (Height, Weight, BMI, Blood pressure and FBS) were measured at pre and posttest level. The informative education programme was given to the experimental group clients. The investigator demonstrated the resistant exercise for experimental group. The data were analyzed and the results revealed that statistically significant improvement in knowledge, treatment compliance and clinical outcomes were found in experimental group and no improvement was found in control group. The study result suggests that the informative education programme and resistant exercise can be used as effective adjunct therapies to promote treatment compliance and control the clinical factors for maintaining a good glycemic control.*

**Key words:** type 2 diabetes mellitus, informative education programme, resistant exercise, treatment compliance, clinical outcomes.

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### INTRODUCTION

Diabetes Mellitus (DM) is a chronic incurable disease of the metabolic process when the pancreas is unable to produce insufficient insulin or when the body doesn't use the insulin produced which is characterized by a high level of blood sugar which in a long run will damage the many-body system's if not controlled properly. Diabetes is mainly of three types - type 1, type 2, and gestational diabetes. The most common type among the three is Type 2 Diabetes Mellitus (T2DM) which is caused by obesity and a sedentary lifestyle mainly [1]. About 422 million people worldwide are estimated to be suffered from DM. The global prevalence of DM among adults over 18 years of age had risen from 4.7% in 1980 to 8.5% in 2014. Globally the number of people with DM has quadrupled in the past three decades. About 1 in 11 adults worldwide have DM, 90% of whom have T2DM. Asia is a major area of the rapidly emerging T2DM global pandemic, with China and India the top two epicentres [2]. DM in India has increased from 26 million in 1990 to 65 million in 2016. Among the 88 million people with DM in South-East Asia, 77 million people with DM is from India accounting for the second most affected in the world, after China. One in six people (17%) in the world with DM is from India. The high prevalence was reported in advanced states

such as Kerala and Tamil Nadu. The prevalence had increased to 12-18% in urban and 3-6% in rural India which are 50-80% higher than in China [3].

DM causes many micro vascular and macrovascular complications causing life-threatening conditions. Exercise is considered an important therapeutic protocol that helps in keeping the glycemic level in control and also helps in maintaining weight and strengths including prevention of cardiovascular risks [4]. Maintenance of exercise program will benefit the T2DM patients for the long term in the prevention of complications and reduce the mortality rates. With the world facing the global pandemic COVID-19, DM patients have a higher risk of getting affected by the disease with an increased mortality rate as well as having difficulty in accessing the health care facilities. Keeping in mind that DM individual is also another comorbid condition likely to be affected with the present pandemic Corona Virus Disease -19 (COVID-19) that the world is facing now. It is important for the health care workers to play a crucial role in providing awareness and promoting health in every possible way to achieve a quality life for an individual. These factors have given a driving force for the investigator to select and conduct the present study by assessing the effects of Informative Education Programme (IEP) and Resistant Exercise (RE) for the control of DM and to develop good treatment compliance among clients with T2DM in selected hospital at Puducherry. The purpose of this study is to assess the effectiveness of nursing interventions on treatment compliance and clinical outcomes among clients with type 2 diabetes mellitus.

## **MATERIAL AND METHODS**

A quantitative research approach was used for this study with a quasi-experimental pretest and posttest research design. A non-probability convenience sampling technique was used to select 60 clients (EG-30, CG-30) aged between 40 and 70 years with T2DM admitted in all wards of AVMC&H, Puducherry. Clients were selected irrespective of the gender, who were willing to participate, who were able to understand and communicate Tamil and/or English, aged between 40 and 70 years, who were being admitted to AVMC&H, Puducherry for treatment and who were willing to follow the nursing interventions. Clients were excluded if they were mentally, visually, and physically challenged, critically ill, who already had diabetic foot ulcers, who had joint pain, who had a hearing impairment and who were already practicing resistant exercise.

The tool used for data collection was divided into two sections, section – A (Part 1: Demographic variables, Part 2: Health profile variables) section – B (Part 1: A structured questionnaire on knowledge regarding DM, Part 2: Treatment compliance statements-modified WHO adherence to long-term therapies and eight items from MMAS, Part 3: Clinical outcomes-anthropometric measurements: height, weight, and BMI; physiological measurement: BP; Bio-physiological measurement: FBS). The demographic variables - includes about 10 items such as age, gender, marital status, religion, education, occupation, family monthly income (in rupees), type of family, and source of getting health-related information. The health profile variables includes-, described as age at onset of T2DM, duration of illness after diagnosis of T2DM, does any of your family have any history of T2DM, do you have any the co-morbid conditions, food habits, do you have any of the following habits, do you take any regular medication for DM before admitting in hospital, do you take any complementary and alternative medicine for DM. A structured questionnaire on knowledge regarding DM. A structured closed-ended questionnaire was prepared by the investigator to assess the knowledge regarding DM. The aspects covered are diabetes and its types, causes, risk factors, symptoms, diagnostic findings, management such as diet, medication, foot hygiene, during travel, and home care management. And to assess the levels of treatment compliance a modified WHO adherence to long-term therapies statement and eight items from MMAS were prepared. To measure the clinical outcomes-wall-mounted height measuring scale, bathroom weight measuring scale, OMRON (HEM-7121J) automated BP monitor and glucometer (Freestyle Optimum Neo H) was used to measure height, weight, BP and FBS; and Quetelet index was used to calculate BMI.

A formal written permission was obtained from the Medical Superintendent (MS) of the AVMC&H, Puducherry to conduct a study and patient information sheet was explained to the clients, and written informed consent was obtained from each study participant before the data collection. The data was collected for a period of six weeks. Three subjects were selected per day based on the inclusion criteria. In the pretest, data on demographic variables, health profile variables, levels of knowledge regarding DM, treatment compliance, and clinical outcomes (BMI, BP, and FBS) were assessed by structured interview schedule, structured knowledge questionnaire and standard instruments. After the pretest, intervention on IEP was administered with a laptop using PPT-assisted teaching along with a translator, and steps of RE were demonstrated. Investigator supervised redemonstration performed by the clients in the EG. Whereas CG received the routine nursing care. The post-test was conducted at time series intervals immediately after RE at 15<sup>th</sup> minutes, on the 15<sup>th</sup> day, and 30<sup>th</sup> day using the same tools.

For analysis a descriptive statistics-number, percentage, mean and standard deviation used to describe demographic variables, health profile and to assess the level of knowledge, treatment compliance and clinical outcomes. Inferential statistics - paired 't' test was used to determine effectiveness of nursing interventions on the knowledge, treatment compliance, BMI, BP, FBS among clients with T2DM in the EG, repeated ANOVA F test was used to determine the comparison of the effectiveness of nursing interventions on the knowledge, treatment compliance, BMI, BP, FBS among clients with T2DM in the EG between pretest and posttests, student independent 't' test was used to determine the comparison of the effectiveness of nursing interventions on the knowledge, treatment compliance, BMI, BP, FBS among clients with T2DM in both EG and CG and chi-square test was used to identify the similarity of demographic variables of all two groups and also applied to ascertain an association between the pretest level of knowledge, treatment compliance, BMI, BP and FBS among clients with T2DM with their demographic and health profile in both EG and CG.

**The data were organized in relation to the objectives and presented under the following sections:**

**Section A:** Distribution of the demographic variables and health profile variables of clients with T2DM.

**Section B:** Assessment of knowledge, treatment compliance, and clinical outcomes in the EG and CG.

**Section C:** Effectiveness of nursing interventions on treatment compliance and clinical outcomes among clients with T2DM in the EG.

**Section D:** Association of pretest knowledge, treatment compliance, and clinical outcomes among clients with T2DM with selected demographic variables and health profile in the EG and CG.

## RESULT

**Section A: Distribution of the demographic variables and health profile variables of clients with T2DM.**

**Table 2: Distribution of Demographic Variables of Clients with T2DM in the EG and the CG  
N = 60**

Demographic Variables		EG (n=30)		CG (n=30)		$\chi^2$	p-value
		n	%	n	%		
Age	Below 50 years	14	46.7	16	53.3	2.40 df=2	0.29
	51 - 60 years	10	33.3	5	16.7		
	Above 61 years	6	20.0	9	30.0		
Gender	Male	13	43.3	16	53.3	0.60 df=2	0.43
	Female	17	56.7	14	46.7		
	Transgender	-	-	-	-		
Marital status	Married	25	83.3	29	96.7	3.63 df=3	0.16
	Unmarried	2	6.7	1	3.3		
	Widow/Widower	3	10.0	0	0.0		
	Divorced/Separated	-	-	-	-		
Religion	Hindu	28	93.4	28	93.3	0.00 df=3	1.00
	Muslim	1	3.3	1	3.3		
	Christian	1	3.3	1	3.3		
	Others	-	-	-	-		
Education	No formal education	8	26.7	5	16.7	9.10 df=6	0.16
	Primary school education	4	13.3	12	40.0		
	Middle school education	9	30.0	6	20.0		
	High school education	4	13.3	3	10.0		
	Higher secondary level	2	6.7	4	13.3		
	Diploma/Intermediate course	2	6.7	0	0.0		
	Collegiate education and above	1	3.3	0	0.0		
Occupation	Government employee	0	0	1	3.3	6.93 df=6	0.32
	Private employee	8	26.7	10	33.3		
	Self-employee	0	0	1	3.3		
	Farmers	8	26.7	7	23.3		
	House-wife	12	40.0	7	23.3		
	Unemployed	0	0	3	10.0		
	Retired	2	6.6	1	3.3		
Family monthly income (in rupee)	>52,734	1	3.3	0	0.0	7.50 df=5	0.18
	26,355- 52,733	-	-	-	-		
	19,759- 26,354	1	3.3	2	6.7		
	13,161-19,758	0	0	1	3.3		
	7,887-13,160	3	10.0	7	23.3		
	2,641-7,886	19	63.3	19	63.3		

	< 2,640	6	20.0	1	3		
Type of family	Nuclear family	23	76.7	19	63	1.27	0.26
	Joint family	7	23.3	11	36	df=	
Source of getting health related information	Family members / relatives	17	56.6	8	26	11.2	0.01
	Friends	5	16.7	5	16		
	Mass media	0	0	8	26		
	Health care workers	8	26.7	9	30		

\*p<0.05, S – Significant, NS – Non Significant

**Table 2** shows the demographic variables of clients with T2DM. About 46.7% in EG and 53.3% in the CG belonged to the age group below 50 years. With regard to gender, 56.7% in the EG were females and 53.3% in the CG were males. Marital status showed, 25(83.3%) in EG and 29(96.7%) in the CG were married. With regard to religion, 28(93.4%) in EG and in the CG were Hindus. Educational status showed, 9(30%) in the EG and 12(40%) in the CG had middle school education. About 12(40%) were housewives in the EG whereas, in the CG, 10 (33.3%) were private employees. Family monthly income showed, 63.3% in the EG and in the CG had a family monthly income from Rs.2, 641 to Rs.7, 886. About 76.7% in the EG and 19(63.3%) in the CG belonged to the nuclear family. In the EG, 17(56.6%) were received health-related information through family members/relatives whereas, in the CG, 9(30%) received health-related information through health care workers.

The chi-square test and p-value <0.05 shows that samples in the EG and CG are homogeneous and comparable with regard to demographic variables in the pretest.

**Table 3: Distribution of Health Profile of Clients with T2DM in the EG and the CG**  
N = 60

Health Profile		EG (n=30)		CG(n=30)		$\chi^2$	p-value
		n	%	n	%		
Age at onset	Below 40 years	15	50.0	14	46.7	4.368	0.224
	40-50 years	12	40.0	9	30.0		
	50-60 years	1	3.3	6	20.0		
	70 years and above	2	6.7	1	3.3		
Duration of illness	Below 6 month	5	16.7	5	16.7	0.776	0.855
	6 month-1 year	2	6.7	4	13.3		
	2 year- 3 years	7	23.3	6	20.0		
	4 years and above	16	53.3	15	50.0		
Any family history	Yes	7	23.3	11	36.7	1.270	0.260
	No	23	76.7	19	63.3		
Any co-morbid conditions	Yes	10	33.3	11	36.7	0.073	0.787
	No	20	66.7	19	63.3		
Food habits	Vegetarian	3	10.0	6	20.0	1.176	0.278
	Non- vegetarian	27	90.0	24	80.0		
Any of the harmful habits	Smoking	3	10.0	4	13.3	0.570	0.966
	Alcohol	6	20.0	4	13.3		
	Chewing tobacco	1	3.3	1	3.3		
	Others	2	6.7	2	6.7		
	No	18	60.0	19	63.4		
Any regular medication	Yes	25	83.3	26	86.7	0.131	0.718
	No	5	16.7	4	13.3		
Any complementary and alternative medicine	Yes	2	6.7	1	3.3	0.351	0.554
	No	28	93.3	29	96.7		

\*p<0.05, S – Significant, NS – Non Significant

**Table 3** shows the health profile of clients with T2DM. Half of the clients in the EG and about 46.7% in the CG were below 40 years at the time of onset of T2DM. With regard to the duration of illness, the majority of the clients in both the groups (EG 53.3% and CG 50%) duration of illness were four years. About 76.7% had no family history of T2DM in the EG and 63.3% in the CG. Twenty percent of the clients in the EG and 63.3% in the CG had no co-morbid conditions. The majority of the clients in both groups were non-vegetarian. Around 60% of the clients in both groups were not having any dangerous habits. The majority of the clients in both the group were taking regular medications and the majority of the clients (93.3%) in the EG and 96.7% in the CG were not taking any complementary and alternative medicines.

The chi-square test and p-value <0.05 show that the samples in the EG and CG are homogeneous but not comparable with regard to health profile in the pretest.

### Section B: Assessment of knowledge, treatment compliance, and clinical outcomes in the EG and CG.

**Table 4: Distribution of Pretest Level of Knowledge, Treatment Compliance and Clinical Outcomes among Clients with T2DM in the EG and CG [N = 60]**

Variables	Category	EG		CG	
		n	%	n	%
Knowledge	Inadequate (0 - 7)	5	16.7	10	33.3
	Moderate (8 - 14)	19	63.3	16	53.4
	Adequate (15 - 20)	6	20.0	4	13.3
Treatment compliance	Low (0 - 5)	7	23.3	4	13.3
	Medium (6 - 10)	20	66.7	19	63.4
	High (11 - 15)	3	10.0	7	23.3
BMI	Under weight	1	3.3	2	6.7
	Normal	21	70.0	20	66.7
	Overweight	8	26.7	7	23.3
	Obese class 1	1	3.3	1	3.3
	Obese class II	0	0	0	0
SBP	Normal	5	16.7	7	23.3
	Pre HTN	23	76.7	19	63.4
	Stage I HTN	2	6.7	4	13.3
	Stage II HTN	0	0	0	0
DBP	Normal	3	10.0	6	20.0
	Pre HTN	17	56.7	15	50.0
	Stage I HTN	10	33.3	9	30.0
	Stage II HTN	0	0	0	0
Blood sugar	Normal	0	0	0	0
	Pre-diabetes	1	3.3	1	3.3
	Diabetes	29	96.7	29	96.7

**Table 4**, reveals the distribution of pretest level of knowledge, treatment compliance, and clinical outcomes among clients with T2DM in the EG and CG. The majority of the 19(63.3%) in EG and 16(53.4%) had moderately adequate knowledge in CG, 6(20%) had adequate knowledge in EG and 4(13.37%) in CG and 5(16.67%) had inadequate knowledge in EG and 10(33.3%) in CG regarding the management of DM. About 66.7% of the clients in EG had medium levels of treatment compliance and 63.4% in CG, 7(23.3%) and 4(13.3%) had low treatment compliance in EG and CG respectively and 3(10%) in EG and 7(23.3%) in CG had high treatment compliance. The majority of the clients 8(26.7%) in EG and 7(23.3%) in CG were overweight, 1(3.3%) were obese class I in both groups, 2(6.7%) were underweight I in CG and 21(70%) and 20(66.7%) were normal in EG and CG respectively. With regard to SBP, 23(76.7%) in EG and 19 (63.4%) in CG had pre-HTN, 5(16.7%) in EG and 7(23.3%) in CG were normal and 2(6.7%) had been stage I HTN in EG and 4(13.3%) in CG respectively. The majority of the clients 17(56.7%) had diastolic pre-HTN in EG and 15(50%) in CG, 10(33.3%) and 9(30%) in EG and CG respectively had stage I diastolic HTN, and 3(10%) had been normal in EG and 6(20%) in CG. The fasting blood sugar showed that 29(96.7%) had diabetes and 1(3.3%) had pre-diabetes in both the groups.

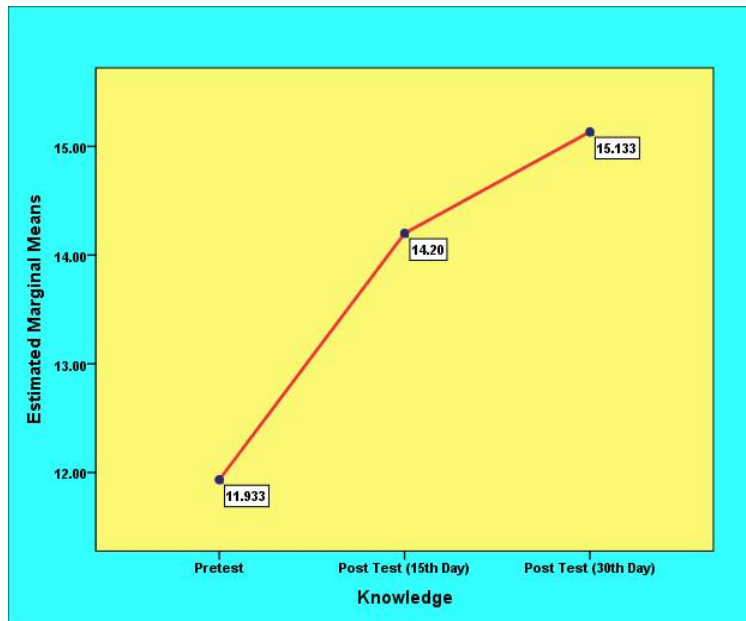
### Section C: Effectiveness of nursing interventions on treatment compliance and clinical outcomes among clients with T2DM in the EG.

**Table 5: Comparison of Mean Knowledge Scores, treatment compliance scores and clinical outcomes scores (BMI, SBP, DBP, FBS) in Pretest, Posttest 1, Posttest 2 and Posttest 3 levels among Clients with T2DM in the EG N = 30**

Nursing interventions		Mean	SD	Paired 't' test	p-value
<b>Knowledge</b>	Pretest	11.93	3.16	<b>4.682</b>	<b>0.0001***</b>
	Posttest 2	14.20	1.83		
	Posttest 2	14.20	1.83	<b>4.157</b>	<b>0.0001***</b>
	Posttest 3	15.13	1.81		
	Pretest	11.93	3.16	<b>5.845</b>	<b>0.0001***</b>
	Posttest 3	15.13	1.81		
<b>Treatment Compliance</b>	Pretest	7.50	2.45	<b>6.814</b>	<b>0.0001***</b>
	Posttest 2	9.87	1.55		
	Posttest 2	9.87	1.55	<b>4.539</b>	<b>0.0001***</b>
	Posttest 3	11.07	1.05		
	Pretest	7.50	2.45	<b>7.944</b>	<b>0.0001***</b>
	Posttest 3	11.07	1.05		
<b>BMI</b>	Pretest	23.60	2.48	1.902	0.067
	Posttest 3	23.52	2.38		
<b>SBP</b>	Pretest	124.33	8.58	0.628	0.535
	Posttest 1	123.60	6.63		
	Posttest 1	123.60	6.63	0.058	0.954
	Posttest 2	123.67	7.18		
	Posttest 2	123.67	7.18	1.072	0.293
	Posttest 3	122.33	5.04		
	Pretest	124.33	8.58	1.293	0.206
	Posttest 3	122.33	5.04		
<b>DBP</b>	Pretest	82.33	6.26	0.571	0.573
	Posttest 1	81.67	4.61		
	Posttest 1	81.67	4.61	1.439	0.161
	Posttest 2	80.33	4.90		
	Posttest 2	80.33	4.90	0.000	1.000
	Posttest 3	80.33	3.19		
	Pretest	82.33	6.26	1.533	0.136
	Posttest 3	80.33	3.19		
<b>FBS</b>	Pretest	217.20	63.93	<b>2.579</b>	<b>0.015*</b>
	Posttest 1	185.67	62.19		
	Posttest 1	185.67	62.19	<b>4.326</b>	<b>0.0001***</b>
	Posttest 2	139.83	30.63		
	Posttest 2	139.83	30.63	<b>4.359</b>	<b>0.0001***</b>
	Posttest 3	117.30	14.00		
	Pretest	217.20	63.93	<b>8.752</b>	<b>0.0001***</b>
	Posttest 3	117.30	14.00		

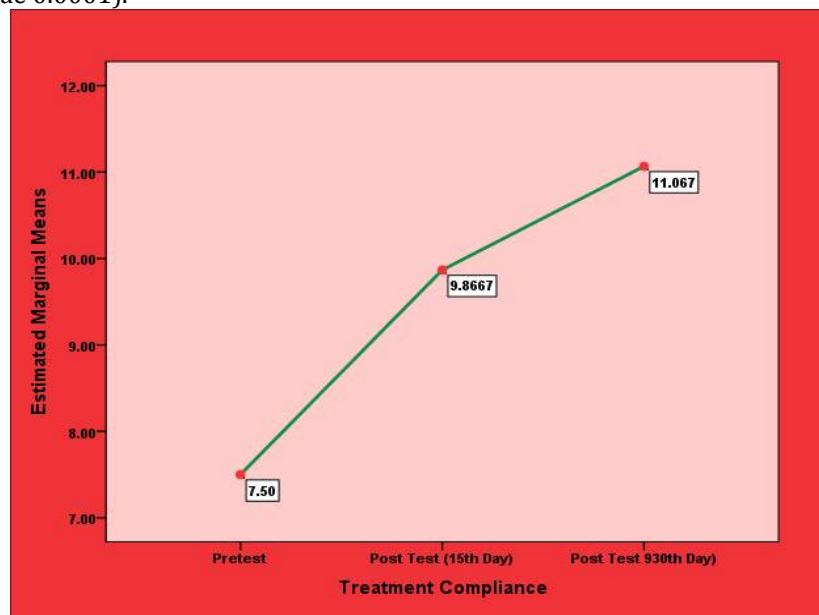
\*\*\*p<0.001, \*p<0.05, S – Significant

**Table 5**, depicts that the knowledge scores, treatment compliance scores and FBS were found to be statistically significant at p<0.05 and p<0.001 levels respectively. This clearly infers that a significant increase in knowledge levels and treatment compliance levels and a reduction in the level of FBS was observed at all stages in the EG after the intervention.



**Fig 1: Multiple Comparison of Pretest and Posttests Levels of Knowledge among Clients with T2DM in the EG**

**Fig 1**, reveals there was a gradual improvement in the mean knowledge score from 11.93±3.16 in the pretest to 14.20±1.83 in the posttest 2(15<sup>th</sup> day). Still further improvement in knowledge occurred at posttest 3 (p value 0.0001).



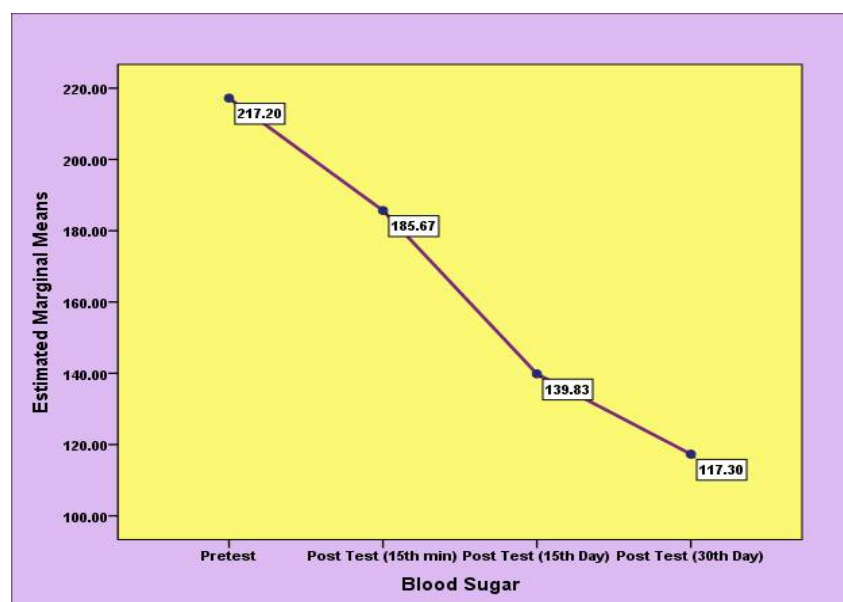
**Fig 2: Multiple Comparison of Mean Treatment Compliance score in Pretest Posttest 2 and Posttest 3 among clients with T2DM in the EG**

**Fig 2**, shows that the pretest mean score of treatment compliance in the EG was 7.50±2.45, the posttest 1 mean score was 9.87±1.55 and posttest 2 was 11.07±1.05. The calculated Repeated Measures ANOVA F - value of 50.400 was found to be statistically significant at p<0.001 level. This clearly infers that significant improvement in the level of knowledge was observed after the intervention in the posttest levels of treatment compliance in the EG.

**Table 6: Multiple Comparison of Pretest, Posttest 1, Posttest 2, and Posttest 3 levels of BP among clients with T2DM in the EG N=30**

Blood Pressure	Tests	Mean	SD	Repeated Measures ANOVA-F	p-value
SBP	Pretest	124.33	8.58	0.820	0.243
	Posttest 1	123.60	6.63		
	Posttest 2	123.67	7.18		
	Posttest 3	122.33	5.04		
DBP	Pretest	82.33	6.26	1.442	0.242
	Posttest 1	81.67	4.61		
	Posttest 2	80.33	4.90		
	Posttest 3	80.33	3.19		

**Table 6**, shows that the pretest mean score of SBP in the EG was  $124.33 \pm 8.58$ , the posttest 1 mean score was  $123.60 \pm 6.63$ , the posttest 2 mean score of  $123.67 \pm 7.18$ , and posttest 3 was  $122.33 \pm 5.04$ . The calculated Repeated Measures ANOVA F – value of 0.820 was not found to be statistically significant. The table also reveals that the pretest mean score of DBP in the EG was  $83.22 \pm 6.26$ , the posttest 1 (15<sup>th</sup> min) mean score was  $81.67 \pm 4.61$ , the posttest 2 mean score of  $80.33 \pm 4.90$ , and posttest 3 was  $80.33 \pm 3.19$ . The calculated Repeated Measures ANOVA F – value of 1.442 was not found to be statistically significant. The above finding clearly infers that there was no significant improvement in the level of blood pressure was observed in the posttest levels of BP in the EG.



**Fig. 3: Multiple Comparison of Pretest, Posttest 1, Posttest 2 and Posttest 3 Levels of FBS among Clients with T2DM in the EG**

**Fig 3**, shows that the pretest mean score of BP in the EG was  $217.20 \pm 63.93$ , the posttest 1 mean score was  $185.67 \pm 62.19$ , posttest 2 mean score was  $139.83 \pm 30.63$ , and posttest 3 was  $117.30 \pm 14.0$ . The calculated Repeated Measures ANOVA F – value of 38.835 was found to be statistically significant. This clearly infers that there was a significant reduction in the level of FBS was observed in the posttest levels in the EG after the intervention.

**Table 7: Comparison of Mean Knowledge score in Pretest, Posttest 2 and Posttest 3 among Clients with T2DM between the EG and CG [N=6]**

Nursing interventions		EG (n=30)		CG (n=30)		MD	Student Independent 't' test	p-value
		Mean	SD	Mean	SD			
Knowledge	Pretest	11.93	3.16	9.87	3.16	2.06	2.279	0.026*
	Posttest 2	14.20	1.83	11.33	3.08	2.87	4.387	0.0001***
	Posttest 3	15.13	1.81	11.97	3.32	3.16	4.588	0.0001***
Treatment Compliance	Pretest	7.50	2.45	8.13	2.27	- 0.6	1.039	0.303
	Posttest 2	9.87	1.55	8.33	1.83	1.54	3.509	0.001***



	Posttest 3	11.07	1.05	8.07	1.84	3	<b>7.769</b>	<b>0.0001***</b>
<b>BMI</b>	Pretest	23.60	2.48	23.19	3.01	0.41	0.571	0.570
	Posttest 3	23.52	2.38	23.18	2.97	0.34	0.489	0.627
<b>SBP</b>	Pretest	124.33	8.58	122.33	9.71	2	0.845	0.402
	Posttest 1	123.60	6.63	121.67	9.49	1.93	0.914	0.365
	Posttest 2	123.67	7.18	122.63	6.83	1.04	0.571	0.570
	Posttest 3	122.33	5.04	123.00	6.51	- 0.67	-0.443	0.659
<b>DBP</b>	Pretest	82.33	6.26	81.00	7.12	1.33	0.770	0.444
	Posttest 1	81.67	4.61	81.00	4.81	0.67	0.548	0.586
	Posttest 2	80.33	4.90	80.67	5.21	- 0.34	-0.255	0.799
	Posttest 3	80.33	3.19	81.33	6.29	- 1	-0.776	0.442
<b>Blood Sugar</b>	Pretest	217.20	63.93	214.07	78.14	3.13	0.170	0.866
	Posttest 1	185.67	62.19	217.47	76.30	- 31.8	1.769	0.082
	Posttest 2	139.83	30.63	158.47	40.62	- 18.64	<b>2.006</b>	<b>0.050*</b>
	Posttest 3	117.30	14.00	140.70	31.46	- 23.4	<b>3.722</b>	<b>0.001***</b>

\*\*\*p<0.001, \*p<0.05, S – Significant, NS- Non-Significant

**Table 7**, reveals that the calculated value of Student Independent 't' test value of knowledge levels, treatment compliance and blood sugar levels was found to be statistically significant at p<0.05 and p<0.001 level.

#### **Section D: Association of pretest knowledge, treatment compliance, and clinical outcomes among clients with T2DM with selected demographic variables and health profile in the EG and CG.**

**i)** Association of Pretest Level of Knowledge with Selected Demographic Variables of Clients with T2DM in the EG – was found to be statistically associated with gender, marital status, type of family and source of getting health related information at p<0.001, p<0.01 and p<0.05.

**ii)** Association of Pretest Level of Knowledge with Selected Health Profile of Clients with T2DM in the EG – was found to be statistically associated only with having any of the following habits such as smoking, alcohol, chewing tobacco, others and no at p<0.05.

**iii)** Association of Pretest Level of Treatment Compliance with Selected Demographic Variables of Clients with T2DM in the EG – was found to be statically associated with age at p<0.01.

**iv)** Association of Pretest Level of Treatment Compliance with Selected Health Profile of Clients with T2DM in the EG –no association was found.

**v)** Association of Pretest Level of Clinical Outcome with Selected Demographic Variables of Clients with T2DM in the EG-

- BMI and FBS – associated with family monthly income (in rupees) at p<0.001.
- SBP – no association was found.
- DBP – association was found with marital status at p<0.001 and type of family at p<0.01.

**vi)** Association of Pretest Level of Clinical Outcome with Selected Health Profile of Clients with T2DM in the EG –

- BMI – associated with food habits at p<0.05.
- SBP and DBP – no association was found.
- FBS – association was found with food habits, any of the harmful habits such as smoking, alcohol, chewing tobacco, others and no, and on any regular medication.

**vii)** Association of Pretest Level of Knowledge with Selected Demographic Variables and health profile of Clients with T2DM in the CG – no association was found.

**viii)** Association of Pretest Level of Treatment Compliance with selected Demographic Variables of Clients with T2DM in the CG - no association was found.

**ix)** Association of Pretest Level of Treatment Compliance with selected Health Profile of Clients with T2DM in the CG – statistically associated with usage of any complementary and alternative medicine at p<0.05.

**x)** Association of Pretest Level of Clinical Outcome with selected Demographic Variables of Clients with T2DM in the CG –

- BMI and FBS- no association was found.
- SBP – associated with age and religion at p<0.05.
- DBP – statistically associated with gender at p<0.05.

xvii) Association of Pretest Level of Clinical Outcome with selected Health Profile of Clients with T2DM in the CG–

- BMI - statistically associated with usage of any complementary and alternative medicine at  $p < 0.01$ .
- SBP - statistically associated with any co-morbid conditions.
- DBP and Blood sugar – no association was found.

## DISCUSSION

This chapter deals with the major findings of the study based on the statistical analysis and pertinence to the objectives of the study and related to the literature of the study. The first objective of the present study was to assess the knowledge, treatment compliance, and clinical outcome of clients with T2DM.

Table 4 reveals that in the EG, the pretest level of knowledge, most of them 63.3% had moderately adequate knowledge, 20% had adequate knowledge and 16.67% had inadequate knowledge. The level of treatment compliance depicts that, 66.7% had a medium level of treatment compliance, 23.3% had low treatment compliance and 10% had a high level of treatment compliance. The BMI showed that 70% had normal BMI, 26.7% were overweight, 3.3% were underweight and obese class I. The study also shows that in the pretest of SBP, 76.7% had systolic pre-HTN, 16.7% had normal BP and 6.7% had stage I HTN. Of the DBP, 56.7% had diastolic pre-HTN, 33.3% had stage I HTN and 10% had normal BP. FBS reveals that 96.7% had diabetes and 3.3% had pre-diabetes in the EG. Table 4 also shows the CG pretest level of knowledge of the majority of the 53.4% had moderate knowledge, 33.3% had inadequate knowledge and 13.3% had adequate knowledge. The level of treatment compliance depicts that, 63.4% had a medium level of treatment compliance, 23.3% had a high level of treatment compliance and 13.3% had a low level of treatment compliance. The study also reveals that in the pretest of BMI, 66.7% had normal BMI, 23.3% had overweight BMI, 6.7% had underweight BMI and 3.3% had obese class I. In the pretest of SBP, 63.4% had systolic pre-HTN, 23.3% had normal BP and 13.3% had stage I HTN. Pretest of DBP also shows that 50% had diastolic pre-HTN, 30% had stage I HTN and 20% had normal BP. Regarding RBS, 96.7% had diabetes and 3.3% had pre-diabetes in the CG. These study findings were supported by the following studies;

Shankari *et al.* (2018) did a non-experimental descriptive study that showed that 2% had adequate, 72% had moderate adequate and 26% had inadequate knowledge about prevention of DM in the pretest [5]. Hashimoto *et al.* (2019) conducted a cross-sectional study and found that a medium level of adherence to medications was associated with high BMI with OR 1.159; 95% CI 1.034–1.300 and poor diabetes knowledge with OR 0.844; 95% CI 0.741–0.961 ( $p=0.031$ ) [6]. Muliyl *et al.* (2017) investigated compliance to treatment among T2DM receiving care at peripheral mobile clinics in a rural block of Vellore District, Southern India, and study results yielded that was a decrease by 0.09% for every 10% greater in compliance [7].

The second objective of the present study was to evaluate the effectiveness of IEP and RE on knowledge, treatment compliance, and clinical outcomes among clients with T2DM between EG and CG.

Tables 7, reveal the posttest mean and SD scores in the EG knowledge and level of treatment compliance were increased at posttest 2 than pretest score and it was improved significantly at posttest 3. So, IEP was more effective in improving knowledge. With regard to clinical outcomes, clients had fewer changes in BMI pre and posttests ( $23.52 \pm 2.38$ ), SBP does not show any changes in all the test intervals ( $123.60 \pm 6.63$ ,  $123.67 \pm 7.18$ ,  $122.33 \pm 5.04$ ), DBP shows less decrease in the posttest levels compared to the pretest ( $81.67 \pm 4.61$ ,  $80.33 \pm 4.90$ ,  $80.33 \pm 3.19$ ) and FBS had a gradual decrease in posttests compared to pretest ( $185.67 \pm 62.19$ ,  $139.83 \pm 30.63$ ,  $117.30 \pm 14$ ). So, RE was effective in decreasing the blood sugar levels, whereas in CG the mean posttest values show no improvement in the level of knowledge ( $11.33 \pm 3.08$ ,  $11.97 \pm 3.32$ ), treatment compliance ( $8.33 \pm 1.83$ ,  $8.07 \pm 1.84$ ), BMI ( $23.18 \pm 2.97$ ), SBP ( $121.67 \pm 9.49$ ,  $122.63 \pm 6.83$ ,  $123 \pm 6.51$ ), DBP ( $81 \pm 4.81$ ,  $80.67 \pm 5.21$ ,  $81.33 \pm 6.29$ ) and a gradual improvement in FBS ( $217.47 \pm 76.30$ ,  $158.47 \pm 40.62$ ,  $140.70 \pm 31.46$ ) compared to pretest.

➤ The obtained repeated ANOVA-F value in EG shows statistically significant at  $p < 0.001$  for knowledge, treatment compliance, and clinical outcomes in FBS (Table 6).

➤ Paired 't' test values show the comparison between pretest and posttests level of knowledge, treatment compliance, and FBS in the EG was statistically significant at  $p < 0.001$  (Table 5).

➤ Student independent 't' test reveals the comparison between pretest and posttests value obtained between the EG and the CG was statistically significant: level of knowledge  $p < 0.05$  in the pretest and  $p < 0.001$  in the posttest 2 & 3; treatment compliance only posttest 2 & 3 was statistically significant at  $p < 0.001$  and FBS shows statistically significant at  $p < 0.05$  in the posttest 2 and posttest 3 ( $p < 0.001$ ). BMI, SBP, and DBP do not show any statistically significant values (Table 7).

These study findings were supported by the following studies; Mamta et al. (2016) conducted a pre-experimental study found that the knowledge score was high in post-test ( $13 \pm 5.01$ ) in comparison to the score with pre-test ( $23.6 \pm 4.5$ ). At the level of CI (95%), the difference was found statistically significant [8]. Mookambika et al. (2016) study results observed that 54% had exercise can control the disease ( $p=0.007$ ) and 35.8% had exercise daily, 60% had the management of DM includes diet, exercise, and drugs [9]. From the above result, it was clear that nursing interventions such as IEP and RE were more effective on knowledge, treatment compliance, and clinical outcomes among clients with type 2 DM clients.

The third objective of the present study was to find out the association between pre-test knowledge, treatment compliance, and clinical outcomes and their selected demographic variables of T2DM between EG and CG.

1. There was a significant association between pretest knowledge score and demographic variables like gender, marital status, type of family, and source of getting health-related information and health profile such as any harmful habits in the EG whereas, in the CG, there was no association found.

2. There was an association between treatment compliance and age ( $p < 0.01$ ) in the EG and also seen an association between treatment compliance and intake of complementary and alternative therapy in the CG and no other demographic variables and health profile were significant with treatment compliance.

3. Following association were found between BMI & FBS and types of food intake, FBS and harmful habits & regular medication in the EG whereas, in the CG, the association found between age and SBP, gender and DBP, religion and SBP and also co-morbidity & complementary and alternate therapy were associated with SBP & BMI.

These study findings were supported by the following studies-Alhaiti *et al* (2020) revealed the adherence to medication commitment activities were most practiced ( $6:13 \pm 1:73$ ), poor adherence to the diet plan ( $2:57 \pm 1:73$ ), and poor exercise adherence with ( $2:13 \pm 2:00$ ). The author concluded that the education conducted by healthcare workers associated with self-management attributes was showed to be significant and had a potential outcome on the health well-being of T2DM Patients [10]. Mokabel et al (2017) concluded that there was corroboration of ameliorated knowledge of routine blood sugar checkups, dietary charts, exercise, and lifestyle characteristics [11]. From the above result, it was clear that there was an association between pretest knowledge, treatment compliance, and clinical outcomes and their selected demographic variables of T2DM clients.

## CONCLUSION

The prevalence of DM is high and it majorly affects the quality of life. Alternative treatment is one of the best methods to control DM as well as to overcome the effects of OTC medications. The data revealed that the nursing interventions- IEP and demonstration of RE had produced positive impact and found to be effective in improving the level of knowledge and treatment compliance and clinical outcomes such as control blood sugar and normal BP and BMI in the EG and less effectiveness was seen in BMI and BP. The study concluded that providing educative program will improve the knowledge of both caregiver and the clients and also following a routine RE regularly at home also will help in controlling the blood sugar levels, BP and ideal body weight and increase the muscle strength as well.

## CONFLICT OF INTEREST

No conflict of interest.

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