Section: Community Medicine

Original Research Article

QUASI EXPERIMENTAL STUDY ON EFFECT OF DIABETIC CLUB IN BRINGING LIFESTYLE MODIFICATION AMONG KNOWN TYPE 2 DIABETES MELLITUS PATIENT IN RURAL SOUTH TAMIL NADU

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ABSTRACT

Background: "Diabetic clubs" specifically—structured peer groups where patients meet regularly under minimal professional supervision helps in bringing life-style changes. **Objective:** To estimate the effect of patient run diabetic club on life style modifications among Type 2 diabetes mellitus patient. **Materials and Methods:** This quasi-experimental study was done in a village under the medical college field practice area among 34 diabetic patients selected through multistage random sampling. Predesigned semi-structured questionnaires, logbooks, monitoring charts, physical measurements were used to collect data on dietary habits, physical activity, medication adherence, footcare, BMI, waist and hip circumference at the baseline, end of first, second and third month after formation of the diabetic club. The interventions featured health education, dietary guidance, promotion of physical activity, and peer group discussions conducted during fortnightly club meetings. FBS, PPBS and HbA1c was measured before and after intervention. Descriptive statistics, repeated measure ANOVA and t test was used for analysis. *P value < 0.05* was considered to be statistically significant.
Results: Statistically significant improvements were noted for medication compliance score (6.88 to 7.60, p value – 0.045), calorie deficit, (373 to 54.73, p value – 0.000), physical activity duration, (8.3 to 23.4 min/session, p value – 0.018), BMI (25.7 to 24.9, p value – 0.0003), waist circumference (96.2 to 95.2cm, p value – 0.0000) and glycosylated hemoglobin, (7.3 to 6.21g/dl, p value – 0.006). No significant change found in foot care, FBS and PPBS.
Conclusion: Diabetic clubs can effectively promote lifestyle modifications. Healthcare providers should integrate peer support interventions into treatment programs, particularly in rural areas where access to healthcare resources is limited.
Keywords: Quasi-experimental study, Diabetic clubs, life style modifications, Type 2 Diabetes Mellitus.

INTRODUCTION

Diabetes mellitus has reached epidemic proportions in India, with an estimated prevalence of 8.9% in adults as on 2023.[1] Rural areas, which account for nearly 65% of India's population, face a growing diabetes burden with prevalence rates increasing from 2.4% in 2000 to approximately 6.5% in 2023.[2] A study done by ICMR-INDAB in 15 states and UT found that Tamil Nadu stood number one with 40 lakhs (9.8%) diabetics and 30 lakh (7.1%) pre – diabetics. Diabetes accounts for 3.3% of all deaths and 2.4% of DALY lost.[3] Type 2 DM is poorly controlled due to lack of adherence to the treatment regimen.

Lifestyle modification is the important aspect in management and control of Diabetes Mellitus. It includes proper diet, physical activity, stress

management, medication adherence, and self-monitoring of blood glucose levels. Healthy eating and increased physical activity can help in both prevention and management of Diabetes.[4] Loss of 5% to 7% of body weight and 150 minutes of moderate-intensity physical activity per week are recommended for good diabetic control as per the current guidelines.[5] Treatment adherence among diabetic patients in rural India is notably poor, with studies indicating that only 30-45% of patients adhere adequately to prescribed medication regimens,[6] bemcause of various reasons like Limited family and social support for disease management, Belief in alternative treatments and misconceptions about modern medicine, Limited health literacy and education , lack of knowledge about the disease and Lack of personalized counselling and dietary advice. In a study conducted by Utz SW et al : Group diabetes self-management had a better score (but non-significant) in activities like carbohydrate spacing, comprehensive foot care items measures, measures of self- efficacy, high rates of goal achievement.[7] In a study done by Kolawole B et al, Patients participated in structured diabetes self- management and multidisciplinary education program .Number of patients adherent to medications were significantly higher in intervention group.[8]

Peer support interventions have emerged as effective strategies for improving chronic disease management globally. Systematic reviews indicate that peer support programs can improve glycaemic control, self-management behaviours, and psychosocial outcomes in diabetes patients.[9,10] Fisher et al demonstrated that peer support interventions reduced HbA1c by 0.76% compared to usual care in low- and middle-income countries.[11] A meta-analysis by Sharma and colleagues found that peer support groups improved medication adherence by 22% among diabetic patients in resource-constrained settings.[12]

"Diabetic clubs" specifically—structured peer groups where patients meet regularly under minimal professional supervision—have shown promise in several international contexts. In rural South Africa, Peer et al. found that village-based diabetic clubs improved medication adherence by 27% and reduced mean HbA1c by 1.1% over 12 months.[13] Similarly, community-based diabetic support groups in rural Thailand,[14] and Vietnam.[15] demonstrated improvements in self-care behaviours, glycaemic control, and quality of life measures.

Study on effect of patient supported groups in improving the treatment adherence in diabetics is lacking in the current geographical area. This intervention if found effective, it helps in policy making of creating a patient run diabetic club under the supervision of MTM team in all the villages of Tamil Nadu. Since all the non-communicable diseases require long term treatment, successful treatment prevents complications and it improves the quality of the life of the patients. Treatment success depends on adherence towards treatment which in turn requires self-motivation, self-care and self-awareness. The motivation can be better improved if the patients with similar illness function as group supporting each other. Hence this study will also form the base for testing similar intervention for other non- communicable diseases. It also forms the base for future multi-centric studies. Hence the need of the study

Objectives: To estimate the effect of patient run diabetic club on life style modifications among Type 2 diabetes mellitus patient.

MATERIALS AND METHODS

This is a Quasi experimental study conducted in a Village which comes under the field practice area of our Government Medical college, among known type 2 Diabetes Mellitus patients below 70 years of age for the period of three months from November 2023 to January 2024. According to study done by Chawla SPS et al,[16] mean difference in Life style modification scores before and after health education was 2.12 and standard deviation difference was 1.24, with 90% power,0.05% alpha, and with non-response/attrition rate 20% sample size calculated was 25. However according to central limit theorem Minimal sample size required for the data to follow normal distribution is 30. So, sample size of 30 was estimated.

Through multistage random sampling technique out of 24 villages under medical college field practice area one village was selected randomly, number of known diabetic patients in the selected village of population 734 was 68. Out of 68, 34 known type 2 diabetic patients were selected randomly. Type 1 diabetes mellitus patients, Patients with type 2 diabetes mellitus of age more than 70 years, type 2 Diabetes mellitus patients on insulin or with other co morbidities, functionally disabled patients, Patient who are not willing to join diabetic club meeting were excluded from our study.

Institutional ethical clearance and written informed consent was got. Confidentiality of the patients were maintained throughout the study.

Baseline data was collected using a predesigned semi-structured questionnaire. It had questions to collect data on basic demographic details; height and weight of the patient; Physical activity: Kind and duration, diet history of the patient; disease history on Type 2 Diabetes mellitus; Medications taken: types, compliance, any side effects; foot care scale with eight items and compliance scale: eight item Morisky Medication Adherence. Glycosylated Hb, fasting and post prandial blood sugar level was also measured during the base line. Both Morisky Medication Adherence scale and foot care scale had binary responses for the questions and each question is scored one for positive response and zero for negative response.

Following parameters were measured every month and at end of three months after the formation of the club using monthly monitoring chart

1. Height (in CMs).
2. Weight (in kgs).
3. BMI = Weight in kg/ Height in m^2.
4. Waist circumference: Measure just above the pelvis.
5. Diet history by 24-hour recall method.
6. **Fasting blood sugar (FBS) (PPBS):** The patients were informed about their FBS and PPBS tests prior to the testing day. The patients were asked to come to PHC after overnight fasting for FBS estimation. To measure the blood glucose levels, a sample of blood was collected from the vein of the patient using two cc syringe. The blood sugar level was measured with the help of glucose kit being used in the PHC. The reagent used in the kit is glucose reagent.
7. **Post prandial blood sugar (PPBS):** After checking the fasting blood glucose levels, the patients were asked to eat their food and come back after a time period of two hours, the blood glucose of the patients were checked again.
8. **Compliance to medications:** This was analysed with the help of compliance scale.
9. Foot care.
10. Physical activity done for the last two weeks.

Glycosylated haemoglobin level was also measured at end of three months

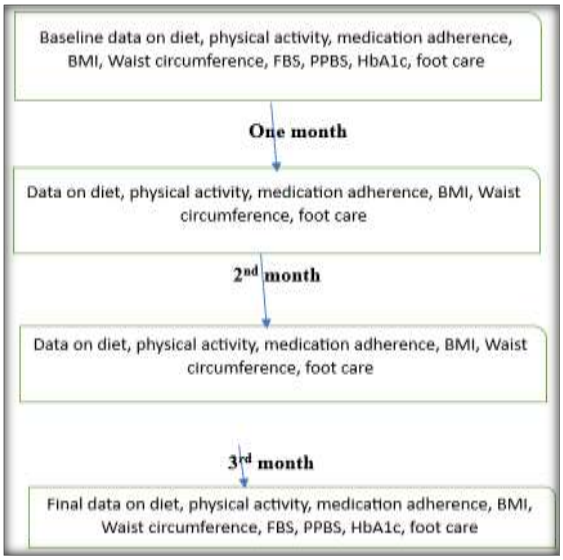
Interventions:

Through a workshop by the trained personals, members in diabetic club was trained about healthy dietary practices, importance of exercise (they will be taught simple aerobic exercises), how to improve their drug compliance and about periodic blood sugar check-up and other investigations to be carried out, self-care, foot care and Home-Based blood Glucose Monitoring. Flip charts and power points in local language were used for giving health education. Base line data was collected for every participant. Each participant was given individual note books to record their everyday dietary intake. Members in diabetic club met once in every 15 days in the health subcentre in their village or in any other common place in the presence of Women health volunteers and women public health nurse of Makkalai Thedi Marunthagam (MTM) team. Medication adherence tracking was done using simple calendar system, Mobile phone-based reminder system and peer accountability. In the club meeting patients discussed about their treatment adherence and the difficulty they face in adhering to the treatment and found out the simple solutions for it. Members also did simple aerobic exercise, group walk ect and prepared simple healthy diabetic foods in each club meeting. Experience sharing and peer support discussions were also held. They were motivated to consume protein, fibre rich foods by distributing healthy snacks like chickpeas, moong dal, green peas, etc. In every meeting health education on life style modification was reinforced.

Adherence to the club activities: were increased by telephone call or SMS reminder about the club meeting. Women Public health nurse, Women Health Volunteer and Village Health Nurse and other community level health workers and local leaders were involved in monitoring club activities, patient with maximum attendance in club meeting was given prize at the end of three months.

Routine diabetic health care was taken by the participants during the study period.

Data collection time line.



Statistical Analysis: data was analysed using SPSS software version 26. Descriptive statistics was used to find frequencies, percentages, mean and standard deviation. Repeated measure ANOVA was used to compare the quantitative variables recorded over three months and paired sample t test was used to compare the mean values before and after intervention. P value < 0.05 was considered to be statistically significant.

RESULTS

Data from a total of 34 type two diabetic patients including both men and women who participated in the diabetic club meeting were included in the analysis.

Figure one shows the age distribution of the study population. Their age ranged from 40 to 70 years. Large number of patients i.e 16 (48%) of them belonged to the age group of 51- 60 years.

Figure two shows the gender distribution of the participants. Out of 34 participants, 20 (60%) were males and 14 (40%) were females. This indicates that males were more interested in joining and participating in the diabetic club compared to females.

Data regarding education, occupation and monthly income of the family were collected. With that data socioeconomic status of the patients were calculated through Modified Kuppusamy scale. From the figure

three, it can be noted that among the selected patients, the prevalence of type two diabetes mellitus is more in upper middle class i.e 72% (24) when compared to other classes.

Out of 34 patients (23) 68% of people were diagnosed with type 2 diabetes mellitus for less than five years. (11) 32% were diagnosed with the disease for more than five years. Mean duration of the disease was 4.21 years

Table one shows that over a period of three months, there was significance increase in medication compliance. The mean score increased from 6.88 of baseline value to 7.60 at the end of three months. Mean score also gradually increased at the end of first and second months but its difference from the baseline value was not statistically significant. But how ever there was a statistically significant increase in the mean compliance score at the end of third month when compared to that of the baseline score before the formation of the diabetic club

Table two indicates that, there was significant change in calorie consumption over three months. There was a drastic decrease in the calorie deficit at end of the first month and then there was a slight increase in calorie deficit at end of second and third months. All these differences were statistically significant.

Regarding physical activity it was noted that at the baseline only 28% of the participants were doing any kind of physical activity. But at the end of three months of intervention, 64% of the participants started to do physical activity. During the baseline data collection, out of 34 participants only ten were doing physical exercise. In these ten participants, eight patients preferred walking and the remaining preferred yoga as their choice of exercise. But on the other hand, after three months of intervention it was 22 patients who did some form of physical activity, 14 patients had chosen walking, six patients had chosen yoga and two people chose their household chores as a form of physical activity.

Table three shows the duration of physical activity done over three months in terms of number of days per week. Compared to baseline mean number of days/week physical activity done increased from 1.76 days/week to 3.24 days/week at end of first, s and third month. But how ever this was not statistically significant. Mean duration per session increased from 8.4 minutes to 23.4 minutes at the end of first, second and third month and it is also statistically significant.

Table four shows the foot care score over the period of three months, the base line score of 5.04 decreased to 4.96 at the end of first and second month and then it increased again to 5.04 at the end of third month. But these differences were not statistically significant. Table five shows change in BMI and Waist circumference over three months. There was statistically significant decrease in BMI from baseline (25.68) to second (25.06) and third months (24.87). and there was also statistically significant decrease in the BMI from first month to third month after intervention. There was also a statistically significant decrease in waist circumference at third month (95.17) after intervention when compared to base line (96.2), first (95.93) and second month (95.47) after intervention.

Table six depicts the change in mean glycosylated Haemoglobin before and after the intervention. There was a statistically significant decrease of mean HbA1c from 7.13 g/dl to 6.21g/dl after the intervention.

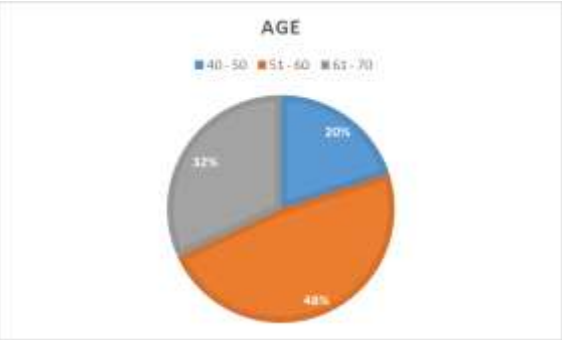


Figure 1: Age distribution of the study population (n = 34)

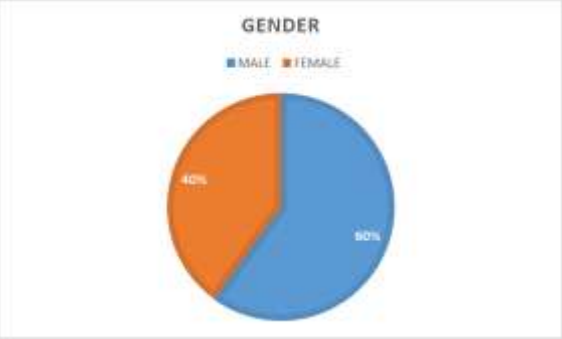


Figure 2: Gender distribution of the study population (n = 34)

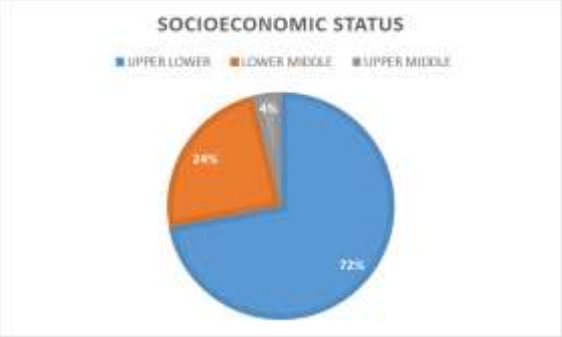


Figure 3: Socio-economic status of the patients from diabetic club (n = 34)

Table 1: Change in medication compliance over 3 months. (n= 34)

Medication Compliance (Mean score)	Months	Mean difference	Standard error	*P VALUE*	95% confidence interval for difference	
					lower limit	upper limit
Baseline (6.88)	1	-0.360	0.150	*0.155*	-0.66	0.06
	2	-0.520	0.184	*0.055*	-0.89	0.15
	3	-0.720	0.114	*0.045**	-0.948	-0.492
1st month (7.24)	Baseline	0.360	0.151	*0.155*	-0.08	0.662
	2	-0.160	0.095	*0.621*	-0.35	-0.03
	3	-0.360	0.199	*0.498*	-0.758	0.038
2nd month (7.40)	Baseline	0.520	0.184	*0.055*	-0.025	0.888
	1	0.160	0.095	*0.621*	-0.03	0.35
	3	-0.200	0.141	*1.000*	-0.482	0.082
3rd month (7.60)	Baseline	0.720	0.114	*0.045**	0.492	0.948
	1	0.360	0.199	*0.498*	-0.038	0.758
	2	0.200	0.141	*1.000*	-0.082	0.482
ANOVA F – 5.35241 * - statistically significant ** - statistically very significant						

Table 2: Measurement of calorie deficit over 3 months (n =34)

Calorie deficit (mean calorie deficit)	Months	Mean Difference	Std. Error	*P VALUE*	95% confidence interval for difference	
					lower limit	upper limit
Baseline (373 kcal)	1	332.520*	35.645	*.000***	261.23	403.81
	2	329.560*	35.679	*.000***	258.202	400.918
	3	322.600*	36.322	*.000***	249.956	395.244
1st month (44.76 kcal)	Base line	-332.520*	35.645	*.000***	- 403.81	-261.23
	2	-2.960*	1.301	*.032**	-5.562	-0.358
	3	-9.920*	3.360	*.007***	-16.64	-3.2
2nd month (47.72 kcal)	Base line	-329.560*	35.679	*.000***	-400.918	-258.202
	1	2.960*	1.301	*.032**	0.358	5.562
	3	-6.960*	2.490	*.010**	-11.94	-1.98
3rd month (54.68 kcal)	Baseline	-322.600*	36.322	*.000***	-395.244	-249.956
	1	9.920*	3.360	*.007***	3.2	16.64
	2	6.960*	2.490	*.010***	1.98	11.94
ANOVA F – 31.1786 * - statistically significant ** - statistically very significant						

Table 3: Duration of physical activities over 3 months (n=34)

Physical activity done (mean days/week)	Months (mean days/week)	Mean Difference	Std. Error	*P value*	ANOVA F	95% confidence interval for difference	
						lower limit	upper limit
Baseline	1 (3.24)	-1.48	0.728	*0.053*	1.377	-2.936	0.001
-1.76	2 (3.24)	1.48	0.728	*0.053*		-0.001	2.936
	3 (3.24)	-1.48	0.728	*0.053*		-2.936	0.001
Physical activity duration/session in minutes	**Months (mean days/week)**	**Mean Difference**	**Std. Error**	***P value***	**ANOVA F**	**95% confidence interval for difference**	
						lower limit	**upper limit**
Base line	1 (23.400)	-15.000*	5.916	*0.018*	2.364	-26.832	-3.168
-8.4	2 (23.400)	-15.000*	5.916	*0.018*		-26.832	-3.168
	3 (23.400)	-15.000*	5.916	*0.018*		-26.832	-3.168
* - statistically significant							
** - statistically very significant							

Table 4: Foot care score over three months (n=34)

Footcare score	Months (mean score)	Mean Difference	Std. Error	*P VALUE*	ANOVA F	95% confidence interval for difference	
						Lower limit	Upper limit
baseline	1 (4.96)	0.08	0.08	*0.327*	0.327	-0.08	0.24

-5.04	2 (4.96)	0.08	0.08	*0.327*		-0.08	0.24
	3 (5.04)	0	0.115	*1*		-0.23	0.23
* - statistically significant							
** - statistically very significant							

Table 5: Change in BMI and Waist circumference over 3 months (n=34)

BMI	Month	Mean Difference	Std. Error	*P value*	ANOVA F	95% confidence interval for difference	
						Lower limit	Upper limit
Baseline (25.68)	1 (25.25)	.438	.241	*.089*	2.875`	-0.044	0.92
	2 (25.06)	.625*	.239	*.020**		0.147	1.103
	3 (24.87)	.812*	.228	*.003***		0.356	1.268
1st month (25.25)	Baseline (25.68)	-.438	.241	*.089*	2.875	-0.92	0.044
	2 (25.06)	.188	.101	*.083*		-0.014	0.39
	3 (24.87)	.375*	.125	*.009***		0.125	0.625
Waist circumference	**Month**	**Mean Difference**	**Std. Error**	***P value***	**ANOVA F**	**95% confidence interval for difference**	
						Lower limit	**Upper limit**
3rd month (95.17 cm)	Baseline (96.2 cm)	-.550*	.206	*.044**	13.771	-0.962	-0.138
	1 (95.93 cm)	-.617*	.135	*.006***		-0.887	-0.347
	2 (95.47 cm)	-.317*	.031	*.000***		-0.379	-0.255
* - statistically significant							
** - statistically very significant							

Table 6: Change in HbA1c over 3 months (n=34)

Months	mean HbA1c (g/dl)	Std. deviation	Mean difference	*P VALUE*	t value	95% confidence interval for difference	
						Lower limit	Upper limit
Base line	7.13	1.82	0.92	*0.006**	2.817	0.2671	0.572
3rd month	6.21	0.56					
* - statistically significant							
** - statistically very significant							

DISCUSSION

This quasi-experimental study done on 34 diabetic patients has proved the significant improvements in medication compliance, physical activity duration, and anthropometric measures like BMI and waist circumference and glycosylated haemoglobin.

In the present study medication compliance score showed significant improvement from 6.88 to 7.60. This represents a clinically meaningful enhancement in diabetes self-management with peer support. This finding aligns with other similar studies on peer support interventions where medication adherence improvement through shared experiences and mutual accountability have been proved.[17,18] Medication compliance scores improved by 8-15% in other community-based diabetes interventions done in India.[19,20] Even a small improvement in medication adherence can lead to significant reduction of diabetes complications and healthcare costs.[21,22]

There was a three-fold increase in physical activity duration from 8.4 to 23.4 minutes, suggesting that the diabetic club successfully motivated participants to engage in more meaningful exercise sessions. Similarly other studies among rural Indian populations have also shown that structured group activities can overcome barriers like lack of motivation, safety concerns, and cultural constraints there by promoting physical activity.[23,24] But in the present study there was no significant change in participation and frequency, suggesting that the intervention was particularly effective at intensifying existing exercise habits rather than recruiting new exercisers.

Tangible physical activities benefit like anthropometric improvements, including BMI reduction from 25.68 to 24.87 kg/m² and waist circumference decrease from 96.2 to 95.17 cm was demonstrated. These changes are consistent with meta-analyses done in South Asian populations showing that community-based diabetes interventions can achieve meaningful weight reduction.[25,26] Similarly another study done by Diabetes Community Lifestyle Improvement Program (D-CLIP) in rural Karnataka, reported similar BMI reductions following three-month community-based interventions.[27] The reduction in waist circumference is more clinically relevant, as it reduces insulin resistance and cardiovascular risk in individuals with type 2 diabetes.[28]

Nonetheless, some limitations must be acknowledged. Selection bias could be introduced due to the quasi-experimental design's lack of randomization, which would limit the capacity to infer causality. Participants who chose to join the diabetic club may have overestimated the intervention's success because they were naturally motivated to change their lifestyle.[29],[30] The relatively short three-month follow-up period is sufficient to demonstrate an initial behavioural change, but it cannot demonstrate that the advantages are long-lasting.

However, this study lays the groundwork for future randomized controlled trial designs with longer

follow-up periods to ascertain causal relationships and the sustainability of the intervention. Additionally, it will serve as the foundation for research examining how the diabetes club model may be modified to address other chronic illnesses that are common in Tamil Nadu's rural areas.

CONCLUSION

Our study produced these results more quickly than many similar interventions, suggesting that the diabetic club model would be particularly useful for kicking off a behaviour change in a timely manner. This study provides compelling evidence that diabetic clubs can effectively promote lifestyle modifications among type 2 diabetic patients in rural Tamil Nadu. Healthcare providers and policymakers should integrate peer support interventions into existing diabetes treatment programs, particularly in rural areas where access to healthcare resources is limited.

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