Section: Community Medicine

Original Research Article

EFFECT OF LIFESTYLE MODIFICATION COUNSELLING ON GLYCEMIC CONTROL IN TYPE 2 DIABETIC PATIENTS AT PHC, CHARGAWAN, GORAKHPUR

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ABSTRACT

Background: This study was carried out to assess the effect of lifestyle modification counselling (LMC) on glycemic control in type 2 diabetic patients. **Materials and Methods:** This quasi-experimental study was conducted among 145 T2D patients in PHC, Chargawan, Gorakhpur, UP. The study participants were allocated LMC group (intervention) and SC group (control). Intervention in the form of LMC was done using a Flip Book. Glycemic control (FBS and 2hPPBS) of both groups was assessed at baseline and after 3 months. The data was analyzed for percentage, mean, standard deviation and t-test. **Result:** In this study, LMC group showed significant improvement in mean FBS (142.9 to 103.6 mg/dl) and mean 2-h PPBS (245.7 to 152.8 mg/dl). Participants of LMC group in age group 30-40 years showed significant improvements in mean FBS (142.9 to 96.6 mg/dl) and mean 2-h PPBS (247.7 to 135.9 mg/dl). Those who were diabetic for <5 years in LMC group showed significant improvement. Mean FBS (141.4 to 74.1 mg/dl) and Mean 2-h PPBS (261.6 to 105.8 mg/dl) was significantly less in LMC group as compared to SC group. **Conclusion:** LMC proved to be effective for better glycemic control along with OPD care as compared to standard OPD care only. LMC flipbook used as an intervention tool may be helpful for T2D patients to improve self-care behavior towards the management of diabetes.

INTRODUCTION

Rising trend in the prevalence of Diabetes Mellitus Type 2 (T2D) has caused a strain on healthcare system of the country by increasing the economic burden.[1] In 2019 the worldwide prevalence of DM is approximately 463 million, out of which the prevalence of DM in India is approximately 77 millions, 90% of which are individuals with T2D.[2]

Lifestyle management is a fundamental aspect of diabetes care which aims to change the behaviour of the patients and encourage them to make healthier choices in life i.e. being physically active, consuming healthy and nutritious food, eating in a time restricted manner, to de-stress, quit smoking and avoid alcohol intake.[3]

Physical activity lowers plasma glucose (during and following exercise) and increases insulin sensitivity. American Diabetes Association (ADA) recommends 150 min/week (distributed over at least 3 days) of moderate aerobic physical activity with no gaps longer than 2 days.[4] It improves the self-esteem and decreases depression,[3] thus benefitting mental state as well. Higher proportions of long-chain polyunsaturated fatty acids have been associated with lower fasting and 2-hour glucose concentrations. Dietary fibre intake (minimum 20 grams/day) has been shown to result in reduced blood glucose levels in people with T2D and impaired glucose tolerance.[5] Time-restricted eating (TRE), an emerging intervention in diet and nutrition area aims to maintain a consistent daily cycle of feeding and fasting in time bound manner to support robust circadian rhythms.[6] Efforts should also be made to quit cigarette smoking since it promotes cardiovascular complications.[5]

The NPCDCS, launched in India in 2010, has one of the major objectives to prevention and control common NCDs through behaviour and lifestyle changes.[7] NCD clinics have been established at CHCs and DHs for comprehensive care of Diabetes and other cardiovascular diseases under NPCDS.

Aims and Objectives: To study the effect of lifestyle modification counselling on glycemic control (fasting and 2-hr post-prandial blood sugar).

MATERIALS AND METHODS

Study Setting: Primary Health Centre, Chargawan, Gorakhpur, Uttar Pradesh
Study Design: Behavioural Interventional Study (QUASI Experimental)
Study Duration: 1 year
Sample size: Estimated sample size using formula $N = 2\times f(\alpha, \beta/2)\times\pi\times(100-\pi)/d2$ (assuming percentage 'success' in both intervention and non-intervention group, π= 80%, equivalence limit, d= 15%, α= 10%, power= 60%) was 130. 10% of calculated sample size was added additionally. Net sample size was 144, ~72 per group.
Study tools:
Questionnaire consisting following sections-

- Sociodemographic profile
- Personal history
- Diabetes related general questions
- Blood sugar parameters

Flip book containing pictorial and written key information regarding management and control of diabetes by self-care activities as intervention tool.
Five key components were used for Lifestyle Modification Counselling (LMC) which are as follows-
Diet- Participants were encouraged to reduce the intake of fatty, salty, and sugary food products and increase the intake of fibrous diet such as whole grain, green vegetables, and fruits. Balanced diet help in glycemic control, weight & blood pressure management. Fibrous diet fruits reduce the blood sugar and cholesterol level. Participants were also motivated to eat the food in time-restricted manner.
Physical Activity- Participants were motivated for regular brisk walk for at least 30 minutes per day. Encouragement for Surya namaskar and yogic exercise was given and advised to adhere the practice for at least 30 minutes per day. Physical activity reduces the blood glucose level, cholesterol and triglycerides, blood pressure, and improves the response of the anti- diabetic drugs. It also helps in stress management and improvement in health-related quality of life.
Stress- Meditation, de-stressing activities like knitting, breathing exercise advised for at least 15 minutes per day to control stress and advised to take proper sleep. During meditation the level of stress hormone (adrenaline cortisol) reduced which further help in glycemic control.
Substance Abuse- Motivational counselling was provided to the participants to quit Tobacco (smoking and chewing tobacco) and excess intake of alcohol. Cessation of tobacco and alcohol helps in management of diabetes and associated risk factors, coronary heart disease.
Compliance- Participants were encouraged to adhere to the counselling regarding lifestyle modification and for routine medical check-ups (blood sugar fasting, PP, HbA1c) at appropriate time. They were also instructed to take their medicine regularly at the proper time without skipping. Routine medical check-ups are necessary to obtain better diabetes management and make patients aware about complications. Medication and adherence with lifestyle modification counselling controls blood glucose more rapidly.
Methodology-
Recruitment and Allocation of Study Participants:
Patients attending OPD were approached and purpose of study was explained verbally. Patients fulfilling inclusion criteria (age {in completed years} ≥30 years with T2D, taking Oral Hypoglycaemic Drugs or Insulin or Both and willing to participate in study after giving consent) were included. Patients with T1D, CKD, on dialysis, bed ridden patients, underlying malignancy, pregnant females with gestational diabetes or unable to comprehend or not willing to participate in study were excluded. After obtaining written consent, patients were allocated into the Lifestyle Modification Counselling(LMC) group and Standard Care(SC) group by consecutive sampling. 152 participants were included. Among these, 77 were allocated in LMC group and 75 were allocated in SC group.

Data collection, intervention, and follow-up counselling

	LMC group	**SC group**
Baseline	Baseline data collection LMC+OPD care	Baseline data collection OPD care only
1st follow up	LMC+OPD care	OPD care only
2nd follow up	LMC+OPD care	OPD care only
3rd follow up	Final data collection	Final data collection

Statistical Analysis: Data collected in MS Excel and analyzed by SPSS (trial version 28.0). For sociodemographic profile, data was described using frequencies and percentages. The blood sugar parameters were described using mean and standard deviation. For establishing association between two variables, cross tabulation was done using Unpaired T test to compare mean and chi square test to compare proportions.

Ethical clearance: The study approval was taken from the institutional ethics committee of BRD medical college, Gorakhpur. (Ref- 22/CRC/2020/21)

RESULTS

A total of 152 participants were recruited of which 4 participants from LMC group and 3 from SC group loss to follow up. Hence, a total of 145 patients, 73

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from LMC group and 72 from SC group were included for final data analysis.

Baseline characteristics of participants: The mean age of participants was 50.1±10.9 years in LMC group and 49.6±9.3 years in SC group. No. of Males were 52.1%and 58.3% and Females were 48.0% and 41.7% in LMC and SC group respectively. Majority of participants in both groups were from rural area. 49.3% and 44.4% in LMC and SC group respectively were Hindu and 41.1% and 44.4% in LMC and SC group respectively were Muslim. Majority of participants were employed i.e. 63.0% and 79.2% in LMC and SC group respectively and belonged to lower Middle Class followed by Middle Class.

30.1% participants from LMC group and 29.2% participants from SC group had T2D for 5-10 years. Majority of participants were on OHD. 64.4% participants from LMC group and 58.3% participants from SC group had family history of T2D. The baseline characteristics of participants are presented in [Table 1 & 2].

Blood Sugar Parameters and Comparison between two groups:

Blood sugar parameters, i.e., FBS and 2-hr PPBS values of LMC group participants and SC group participants were recorded and mean value for each parameter was taken at baseline and after 3 months follow up.

Mean FBS in LMC group was 142.9 mg/dl and in SC group was 142.4 mg/dl at baseline. No significant difference was observed in mean FBS value in both groups at baseline. After 3 months follow up, mean FBS in LMC group was 103.6 mg/dl and in SC group was 119.6 mg/dl. It was observed that mean FBS value in LMC group was significantly less as compared to mean FBS value in SC group.

Similarly, Mean 2-hr PPBS in LMC group was 245.7 mg/dl and in SC group was 229.2 mg/dl. Both values were not significantly different at baseline. However, after 3 months follow up, mean 2-hr PPBS in LMC group was 152.8 mg/dl and in SC group was 168.3 mg/dl. It was observed that mean 2-hr PPBS value in LMC group was significantly less than Mean 2-hr PPBS value in SC group. The details of results are given in [Table 3].

Significant changes were observed in participants of 30-40 years when the data was analysed according to the age groups. Mean FBS of participants belonging to age group 30-40 years in LMC group was 96.6 mg/dl and in SC group was 117.8 mg/dl after 3 months follow up. Mean FBS value in LMC group was significantly less as compared to SC group in participants belonging to age group 30-40 years. Similarly, mean 2-hr PPBS value in LMC group (135.9 mg/dl) was significantly less as compared to mean 2-hr PPBS value in SC group (174.9 mg/dl) in participants belonging to age group 30-40 years. The detailed analysis is given in [Table 3].

Participants who were diabetic for less than 5 years showed significant improvements. Mean FBS of participants who were diabetic for less than 5 years in LMC group was 74.1 mg/dl was significantly less as compared to mean FBS of participants in SC group was 120.4 mg/dl after 3 months follow up. Similarly, mean 2-hr PPBS value in LMC group (105.8 mg/dl) was significantly less as compared to mean 2-hr PPBS value in SC group (168.2 mg/dl) in participants who were diabetic for less than 5 years.

Blood sugar parameters were improved in participants who were diabetic for five or more than five years also, however, no significant difference was observed in both, LMC and SC group. The results are shown in [Table 4].

Other parameters e.g. Socioeconomic status, educational qualification, marital status was also analysed.

Compliance of the participants was also analyzed and it was observed that participants who showed better compliance had better glycemic control than others.

Table 1: Socio-demographic Profile of study participants allocated to LMC group vs SC group

S. No.	Socio-demographic Profile		LMC Group (N=73)		SC Group (N=72)	
			n	%	n	%
1.	Age (in completed years)	30-40	17	23.3	11	15.3
		41-50	24	32.9	29	40.3
		51-60	16	21.9	23	31.9
		>60	16	21.9	9	12.5
2.	Sex	Male	38	52.1	42	58.3
		Female	35	48.0	30	41.7
3.	Residence	Rural	55	75.3	59	81.9
		Urban	18	24.7	13	18.1
4.	Religion	Hindu	36	49.3	32	44.4
		Muslim	30	41.1	26	36.1
		Others	7	9.6	13	18.1
5.	Marital Status	Married	58	79.5	58	80.6
		Unmarried	4	5.5	3	4.2
		Divorced & Widower/Widow	11	15.1	10	13.9
6.	Educational Qualification	Illiterate & Primary School	23	31.5	6	8.3
		Middle School	23	31.5	37	51.4
		High School	16	21.9	22	30.6
		Intermediate	4	5.5	5	6.9
		Graduate, Post-Graduate & Others	7	9.6	2	2.8
7.	Employment Status	Unemployed	27	37.0	15	20.8
		Employed	46	63.0	57	79.2

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8.	Socio-economic Status	Upper Class	9	12.3	4	5.6
		Upper Middle Class	10	13.7	11	15.3
		Middle class	21	28.8	21	29.2
		Lower Middle Class	27	37.0	32	44.4
		Lower Class	6	8.2	4	5.6

Table 2: Personal History of study participants allocated to LMC group vs SC group.

S. No.	Personal History		LMC Group (N=73)		SC Group (N=72)	
			n	%	n	%
1.	No Substance Abuse	Non-Smokers	23	31.5	30	41.7
		Non-Alcoholic Consumption	27	37.0	22	30.6
2.	Duration Of Illness (in completed years)	<5	14	19.2	14	19.4
		5-10	22	30.1	21	29.2
		11-15	12	16.4	13	18.2
		16-20	15	20.6	12	16.7
		>20	10	13.7	12	16.7
3.	Treatment	OHD	44	60.3	52	72.2
		Insulin	7	9.6	6	8.3
		Both	22	30.1	14	19.4
4.	Family History of T2D	No	26	35.6	30	41.7
		Yes	47	64.4	42	58.3

Table 3: Comparison of Blood Sugar Parameters (FBS and 2-hr PP) of Study Participants of LMC and Standard care group at baseline and after 3 months follow-up

S. No.	Blood Sugar Parameter		LMC Group (n= 73)	Standard Care Group (n= 72)	P value (by unpaired t-test)
			Mean (±SD) (in mg/dl)	Mean (±SD) (in mg/dl)	
1.	Fasting Blood Sugar	Baseline	142.9 (±27.2)	142.4 (±24.3)	0.922
		After 3 month follow-up	103.6 (±23.0)	119.6 (±20.9)	<0.001
2.	2-hr Post Prandial Blood Sugar	Baseline	245.7 (±85.2)	229.2 (±82.3)	0.641
		After 3 month follow up	152.8 (±45.0)	168.3 (±41.5)	0.034

Table 4: Comparison of FBS and PPBS of Study Participants of both groups at baseline and after 3 months follow-up according to age group

Age	LMC			Standard Care			P value
	N	B 3M	Mean (± SD)	N	B 3M	Mean (± SD)	
FBS							
30-40	17	B	142.9 (± 20.2)	11	B	144.7 (± 28.0)	0.844
		3M	96.6 (± 23.0)		3M	117.8 (± 19.3)	0.018
41-50	24	B	145.3 (± 28.8)	29	B	144.0 (± 21.5)	0.843
		3M	103.7 (± 23.7)		3M	117.9 (± 20.2)	0.022
51-60	16	B	148.7 (± 29.6)	23	B	146.3 (± 27.5)	0.793
		3M	108.2 (± 16.2)		3M	122.4 (± 21.2)	0.030
>60	16	B	133.2 (± 28.8)	9	B	124.9 (± 12.9)	0.425
		3M	106.3 (± 27.7)		3M	120.6 (± 26.7)	0.222
PPBS							
31-40	17	B	247.7 (± 67.9)	11	B	240.6 (± 82.1)	0.806
		3M	135.9 (± 38.5)		3M	174.9 (± 42.6)	0.018
41-50	24	B	248.6 (± 87.2)	29	B	211.6 (± 41.6)	0.051
		3M	156.1 (± 52.2)		3M	157.8 (± 37.6)	0.893
51-60	16	B	242.5 (± 94.6)	23	B	258.3 (± 94.8)	0.611
		3M	169.5 (± 33.7)		3M	180.8 (± 41.2)	0.371
>60	16	B	242.4 (± 96.4)	9	B	274.3 (± 123.3)	0.480
		3M	149.3 (± 46.6)		3M	161.1 (± 49.4)	0.555

Table 5: Comparison of FBS and PPBS of Study Participants of both groups at baseline and after 3 months follow-up according to Duration of Illness

Duration of Illness	LMC			Standard Care			P value
	N	B 3M	Mean (± SD)	N	B3M	Mean (± SD)	
FBS							
<5	14	B	141.4 (± 34.6)	14	B	140.7 (± 24.1)	0.956
		3M	74.1 (± 2.6)		3M	120.4 (± 26.6)	<0.001
5-10	22	B	144.6 (± 19.9)	21	B	147.9 (± 21.4)	0.605
		3M	106.2 (± 20.5)		3M	114.6 (± 20.4)	0.182
10-15	12	B	142.4 (± 18.3)	13	B	148.0 (± 23.7)	0.520
		3M	108.2 (± 18.5)		3M	119.0 (± 16.0)	0.134
15-20	15	B	137.2 (± 28.0)	12	B	135.7 (± 25.3)	0.881
		3M	115.0 (± 14.2)		3M	122.7 (± 22.0)	0.279
≥20	10	B	150.2 (± 39.0)	12	B	135.7 (± 29.3)	0.333

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		3M	116.6 (± 26.9)		3M	125.3 (± 19.2)	0.387
PPBS							
<5	14	B	261.6 (± 99.3)	14	B	237.6 (± 79.2)	0.487
		3M	105.8 (± 7.5)		3M	168.2 (± 49.3)	<0.001
5-10	22	B	240.3 (± 65.0)	21	B	205.7 (± 42.5)	0.046
		3M	163.5 (± 46.4)		3M	158.6 (± 38.3)	0.699
10-15	12	B	248.5 (± 79.2)	13	B	253.8 (± 97.9)	0.887
		3M	163.2 (± 78.1)		3M	168.1 (± 32.5)	0.739
15-20	15	B	230.1 (± 91.7)	12	B	269.8 (± 98.9)	0.291
		3M	154.3 (± 28.5)		3M	181.7 (± 46.5)	0.107
≥20	10	B	255.6 (± 110.7)	12	B	254.6 (± 97.0)	0.982
		3M	180.5 (± 48.1)		3M	172.5 (± 45.7)	0.695

DISCUSSION

The present study aimed to determine the effect of LMC on glycemic control (FBS and 2-hr PPBS). It focussed on 145 T2D patients attending NCD clinic at PHC, Chargawan, Gorakhpur, UP. A final assessment of 145 participants divided into LMC group(73) and SC group(72) was done.

At baseline, no significant difference was observed in mean FBS level and mean 2-hr PPBS level of LMC group (142.9 and 245.7mg/dl respectively) and SC group (142.4 and 229.2mg/dl respectively). After 3 months, the mean FBS level and mean 2-hr PPBS level of LMC group (103.6 and 152.8mg/dl respectively) was significantly low as compared to SC group (119.6 and 168.3mg/dl respectively). This shows the association of LMC with improved blood sugar parameters in given time, which leads to better glycemic control.

A randomized controlled trial by Rahul A et al,[8] 2021 reported similar results. A quasi-experimental prospective study conducted by Girija K et al,[9] 2018 in Delhi Diabetes Research Centre, New Delhi, LMC showed significant improvement in FBS(175.5±32.3 to 144.7±17.6mg/dl), 2-hr PPBS(275.5±61.3 to199.0±48.3mg/dl) in intervention group and was coherent with current study.

In age group 30-40 years, mean FBS level and mean 2-hr PPBS level was significantly low in LMC group (96.6 and 135.9mg/dl respectively) as compared to SC group (117.8 and 174.9mg/dl respectively) after 3 months of LMC. The study shows the association of younger age with better glycemic control. However, Shamshirgaran SM et al, 2017,[10] reported contradictory findings that glycemic control was better among the middle (50-59 years) and the older age groups (≥60 years) in comparison with the younger age group (≤ 49 years). Some other studies reported better glycemic control among older age group.[11-14]

In present study, LMC group participants who had diabetes for <5 years also showed significant improvement in mean FBS level and mean 2-hr PPBS level (74.1 and 105.8 mg/dl respectively) as compared to SC group participants (120.4 and 168.2 mg/dl respectively). This shows that LMC is effective in achieving better glycemic control in case of early diagnosis of T2D. Similar finding was reported by Mendes AB et al,[15] 2010 after a cross-sectional and nationwide survey in Brazil.

CONCLUSION

This study concluded that Lifestyle Modification Counselling was effective in improving glycemic control of LMC group participants as compared to SC group participants. In LMC group, mean FBS and mean PPBS of those who had diabetes for <5 years showed significant improvement as compared to other age group within the group and also if compared with SC group participants of same sub-group. Also, it was observed that glycemic control was better in participants who were in age group 30-40 years group and received LMC along with standard treatment as compared to the other age groups within the group and similar SC sub-group as well.

Recommendation: Since LMC was found to be effective in controlling diabetes in present study, emphasis should be given on LMC of diabetic patients along with medical treatment during consultation as early as possible. A trained counsellor should be posted on every health facility having diabetes patients or any existing healthcare staff can be identified and trained for the same. NGOs may be helpful in this regard.

Grass root level workers, medical students and interns should be sensitized regarding LMC so that they can be helpful in giving LMC during their field visits. Technology innovations such as Lifestyle modification apps/videos should be promoted to reach more diabetic patients.

Limitation: The study was compromised due to Covid-19. Measuring HbA1c levels in study participants was not possible due to limitation of resources and time.

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