Original Article

Role of Counselling and its Impact on the Dietary Habits, Glycemic Control and Diabetic Awareness of Newly Diagnosed Type 2 Diabetes Mellitus Patients

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Background : Type 2 Diabetes Mellitus is a lifestyle disorders and it leads to complications that are life threatening which can be prevented by proper Counselling and Diet monitoring of patients.

Objective : To evaluate effect of Counselling on the Glycemic control, Dietary habits and Diabetes awareness of type 2 DM patients.

Method : A randomized clinical trial was conducted at a tertiary hospital. 96 subjects were randomized and baseline data was gathered from all patients included in the study. Out of these 48 patients were given Counselling on various aspects of Diabetes including diet, complications, medication, lifestyle modifications, exercise etc. Lab investigations and Diet calculations were done on first and 4 months later to measure the effect of Counselling on patient's Diet and Glycemic control and Diabetes awareness.

Results : Diabetic awareness was measured in terms of number of correct responses which increased from 325 to 542 in Intervention group and from 357 to 402 in Control group. The increase in intervention group (22.60%) was more than that of the Control group (4.59%). The amount of calories in the diet of intervention and control group was respectively 2322±371 and 2334±460. Post Intervention it was 2344±400 and 2056±267 respectively. Before intervention the difference in the amount of Calories, FBS, PP2BS between the 2 groups was statistically insignificant. But after intervention the difference with reference to total calories (p=0.0003), FBS (p=0.01) and PP2BS (p=0.0001) became statistically significant.

Conclusion : Counselling led to a significant improvement in the Diabetic awareness, Glycemic control and Dietary habits of patients in terms of caloric intake.

The prevalence of Diabetes is increasing all over the world. According to an estimate 285 million people were suffering from Diabetes in the world in 2010. 90% of them were Type 2 Diabetes Mellitus (DM) patients. The world diabetic population is estimated to reach 366 million by 2030[1].

Management of DM includes both Pharmacotherapy and Counselling the patient about lifestyle changes. Lifestyle changes (eg, dietary regulations, exercise, self-care) are cheap, help in reducing doses of oral hypoglycaemic drugs and delay shifting of Pharmacotherapy from oral hypoglycaemic drugs to Insulin. Thus patient education, involvement and awareness about these aspects are paramount for the successful care of diabetes.

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Editor's Comment :
- Regular counselling of type 2 diabetes leads to improvement in diabetes awareness, change in choosing food items such as cutting the carbohydrate intake and this leads to overall glycemic control.

Diet, especially excessive caloric intake is a major driving force behind the escalation of obesity and Type-2 Diabetes worldwide. In particular, higher dietary Glycemic Index ,Glycemic Load (GL)[2,3] and trans-fats are associated with increased diabetes risk, whereas greater consumption of cereal fibre and polyunsaturated fat is associated with decreased risk. Diligent Counselling of patients, with the aim of improving their awareness and encouraging early incorporation of lifestyle changes especially dietary changes might help enhance Glycemic control, quality of life and delay disease progression.

Therefore, the present study was performed to evaluate the role of Counselling and its impact on the diabetes awareness, Dietary habits and Glycemic control of newly diagnosed Type 2 DM patients visiting a Tertiary hospital.

MATERIALS AND METHODS

Sampling :

From August, 2014 to December, 2015, an RCT (Randomised control trial) was conducted for which Type 2 DM patients were selected from the patients visiting the diabetic clinic and medical OPD in a tertiary care hospital. Expecting a 40% increase in the number of patients with "good Glycemic control" in the Intervention group and 10% increase in the Control group from baseline and by keeping alpha risk at 5% and power at 90%, the calculated sample size was 78,39 in each group. By adding around 20% loss to follow up, the sample size increased to 96, 48 in each group. So 96 subjects were randomized and included in the study, 48 in each group. Sample size calculation was done using software Medcalc (version 12.5.0).

Newly diagnosed patients of Type 2 DM in the age group of 25 to 65 years were included in the study. Pregnant females, patients unwilling to take part in the study, patients with diagnosis duration <1 month or >4months and those with physical deformities or severe disease other than DM were not included in the study. Patients who had changes in their pharmacological prescription before the second visit, those with past history of Ketoacidosis or severe complications eg, Nephropathy, Neuropathy or CAD were excluded.

A list of newly diagnosed patients was drawn from the medical OPD register. As number of registered patients whose diagnosis was made in the last 2 to 4 months was less than our required sample size, we continued tracing patients from the register till actual sample size of 96 was achieved. Then these 96 patients were listed and randomized using random numbers generated by the software Epi info 7. Thus, patients were divided into separate groups – intervention and control group with 48 patients in each. But 16 patients left the study and did not return for follow up (dropout rate of 16.66%), so further study was carried out with 40 patients in each group. Registration numbers of the patients selected from the diabetic clinic and medical OPD were used for personal information, clinical profile, lab diagnosis and other details.

Diabetes Awareness :

To assess and measure the baseline understanding and practice of all the participants of both the groups, they were asked to fill a questionnaire (Table 1) which was imparted in a language intelligible to the patient (Gujarati) at 0 month. After filling the questionnaire all subjects of intervention group were counselled. Questionnaire similar to previous kind was given to the patients of both the groups on a follow up visit (after 4 month) to assess and measure improvement in the awareness if any. Some of the question had one correct option and some had multiple correct answers. Patients were given 20 minutes to mark correct answers.

Diet Calculation and Lab Investigations :

Diet evaluation of the patients was done at 0 and 4th month of both the groups. Diet calculation was done by 24 hours recall method provided that pt has taken his regular diet on the previous day of Counselling. Answers of question 22 and 23 (Table 1) were derived from the diet calculation data only. For fat intake the cut off was set at 20% of total calories.

During first visit and at the 4th month Weight, Height, BMI and Blood Pressure were measured of all patients. Anthropometric measurements like Weight and Height were taken using standard techniques and standardised instruments. BMI was calculated using formula Weight in Kg/(Height in meters)^2. Obesity's WHO criteria for was used to define obese. (BMI > 25 kg/m^2 is Overweight).

Laboratory investigations namely Post Prandial Blood Glucose (PP2BS), Fasting Blood Glucose (FBS) and Random Blood Glucose (RBS) were done in both the groups. All these investigations were done in SSG hospital only. Blood samples from the both groups were drawn under a complete aseptic precaution, after obtaining complete informed consent. For estimation of Blood Glucose a fluoride vacuumed evacuated tubes were used. Blood Glucose was measured by Glucose Oxidase-Peroxidase Enzymatic Method.

Counselling :

Components of Counselling comprised general information about Diabetes and its complications, diet modification, physical activities, medication and its side effects, danger signs and symptoms of Hypoglycaemia. Patients were first introduced to a video of about 15 minutes that contained all the above mentioned information and then the patient was counselled for 7-15 minutes. At the end of first session, take home material on Diabetes was provided to the patients in form of leaflets/ booklets. Patients were given skill based training on how to do Blood Glucose monitoring by glucometer and Uri-stick.

Diet calculation was done on first and last visit for both the groups to measure the effect of Counselling on patient's diet. It was calculated by using a diet calculator (developed by Dr Raja Namidi, National Institute of Nutrition, Hyderabad), which uses raw material, cooked food and actual food consumption. Change in diet related practice in terms of Carbohydrate, Protein and Fat was also calculated & Post Counselling differences between two groups was measured.

Ethical Issues :

The standard drug therapy that was prescribed by a Physician in the medical OPD was not changed in the both groups. Apart from this, the intervention group received additional Counselling on Diabetes. The study was approved by Institutional Ethics Committee for Human Research (IECHR). After completion of the study, patients of the control group were contacted telephonically and called for Counselling. They were then given the same Counselling and information booklets as the intervention group.

Operational Definitions :

• **Type-2 Diabetes Mellitus :** group of disorders characterized by variable degrees of insulin resistance, impaired insulin secretion and increased Glucose production.

Criteria for Diagnosis of Diabetes Mellitus

Symptoms of DM : Polydipsia, Polyuria and unexplained weight loss & Random Blood Glucose concentration $\geq$200mg/dl[a]

OR

Fasting Plasma Glucose $\geq$126 mg/dL)[b]

OR

HbA1C > 6.5% [c]

OR

Two-hour Plasma Glucose $\geq$200mg/dL) during an oral Glucose Tolerance Test (GTT)[d]

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[a]*Random is defined as without regard to time since the last meal.*

[b]*Fasting is defined as no caloric intake for at least 8 h.*

[c]*The test should be performed in laboratory certified according to A1C standards of the */Diabetes Control and Complications Trial.*

[d]*The test should be performed using a glucose load containing the equivalent of 75 g anhydrous glucose dissolved in water, not recommended for routine clinical use.*

• **Exposure / Exposed :** Here "Exposure" means "Counselling. Exposed means participants who got counselled in the first visit. ie, Intervention group.

• **Good Outcome (Glycemic control) :** patient having FBS < 126 mg/dl and PP2BS <200 mg/dl

• **Bad Outcome (Glycemic control) :** patient having FBS > or = 126mg/dl or PP2BS > or = 200 mg/dl

RESULTS

In the study population mean age of intervention and control were 48.63±7.32 and 49.08±6.48 respectively. Number of females in the Intervention Group was 16 (40%), while in the control group there were 22 females (55%). Mean age of female in intervention and Control Groups were 50.43 ± 8.27 and 48.77±5.30 respectively. Mean age of male in intervention and Control Groups were 47.42 ± 6.51 and 49.44 ± 7.83 respectively.

4 patients (10%) in Intervention Group and 3 patients (7.5%) in Control Group had their age below or equal to 40 years. In the age group of 41 to 50 years, intervention group had 22 (55%) participants and control group had 21 (52.5%) participants. Intervention Group had 14 (35%) patients above the age of 50, while Control Group had 16 (40%).

Both the groups had equal number of Hindus 36 (90%) and Muslims 4 (10%). None of the participant belonged to any other religion.

Socio-economical classification of the participants was done using modified Prasad's Classification.6 (15%) participants of an Intervention and 9 (22.5%) participants of a Control Group were from upper class. In the Intervention Group 20 (50%), 12 (30%) and 2 (5%) participants belonged to upper-middle, middle-middle and lower-middle class respectively. Similarly in the Control Group 16 (40%) and 15 (37.5%) belonged to upper-middle and middle-middle class respectively, while none of the participants was from lower-middle class. Also none of the participants belonged to lower class in either group.

2 (5%) participants from the Intervention and 3 (7.5%) participants from the control group were uneducated. 18 (45%) and 22 (55%) participants in Intervention and Control Group respectively had completed primary schooling. In Intervention Group 19 (47.5%) and 14 (35%) from Control Group completed secondary or higher-secondary school. Two participants, one participant from the Intervention Group and one from the Control Group, were graduates.

To check if after the randomization both the groups were comparable with regards to Age, Sex, Religion, Socio-economic class and Education, difference between proportions and means for all mentioned variables of both the groups was calculated. This difference was statistically insignificant (p>0.05 for each variable).

Means of Height, Weight and BMI of Intervention group were 67.00 ± 13.12, 160.20 ± 11.35 and 26.19 ± 5.21. Means of these factors in Control Group, in that specific order, were 66.35 ± 10.69, 160.37 ± 8.94 and 25.72 ± 3.11. Systolic BP of intervention group was 135.55±17.86 and that of control group was 131.15 ± 12.59. Similarly Diastolic BP of intervention group was 82.85 ± 8.59 and that of Control Group was 81.90 ± 9.83. Difference between both groups with respect to each of these variables was measured to see if both the groups are comparable.

42.5% (n=17) patients of Intervention Group and 47.5% (n=19) patients of Control Group had their BMI in normal range, while 52.5% (n=21) of the participants of intervention group and 52.5% (n=21) participants of

Control Group were above the normal limit of BMI (either overweight or obese). None of the participants in Control Group and only 2 participants of intervention group had their weight below normal. Proportion of the Hypertension in the Intervention Group was 35% (n=14), while in Control Group it was 30% (n=12). The difference was not statistically significant.

When asked about presence of Diabetes in family, only 5 (6.25%) said that at least one of their blood relative had Diabetes, out of these 4 were from Intervention Group and only one was from Control Group. Fisher's exact test was applied to see the difference between both the groups with respect to presence of family history. Difference was not statistically significant (p <0.36)

Only 6 patients were put on mono-therapy with Metformin (MT) and all of them got allocated to the control group. 85% (n=34) participants in the Intervention Group and 80% (n=34) patients in the Control Group were prescribed Glipizide (GPZ) and Metformin. 6 patients of Intervention Group and one patient of control group were prescribed Glimiperide (GMP) and Metformin. Three drugs of Glipizide, Metformin and Voglibose (VGB) were prescribed to only one patient of control group. These drug groups were rearranged and only two groups were made according to their capability to reduce Blood Sugar – group 1 included MT or GPZ+MT which had less capacity to reduce Blood Sugar than group 2 which included patients on MT+GMP or GPZ+MT+VGB. A chi squared test was applied to see the difference between these two groups. This difference came statistically insignificant.

When patients were asked if they took their medicines regularly, 42.5% (n=17) from the Intervention Group and 47.5% (n=36) patients from the Control Group said "no". This difference was statistically insignificant.

10 participants (25%) of the Intervention Group had one or more type of addictions majority 30 (75%) of patients had none. 9 participants (22.5%) of the Control Group had one or more type of addictions while majority 31 (77.5%) of patients had

none. Thus, 61 (78.25%) participants were neither alcoholic nor using any form of tobacco. None of the participants were addicted to any other substance.

The proportions of correct responses to the questions in the questionnaire in Intervention and Control Group before after Counselling are shown in Table 1. At baseline the number of correct responses was more in Control Group than intervention group but this difference was statistically not significant. Before intervention in an Intervention Group, out of possible 960 correct responses only 325 (33.85%) were registered. This number of correct responses rose to 542 (56.45%) after intervention. Before intervention in a Control Group, out of possible 960 correct responses only 357 (37.18%) correct responses were registered, the number of correct responses rose to 402 (41.87%) on the second visit. Even though the number of correct responses in absolute terms increased in both the groups, Intervention group showed much more increase (22.60%) than the Control Group (4.59%).

At baseline patients in both Intervention and Control Group had poor knowledge about the various

Table 1 — *Level of Awareness in both Groups (Corrected Responses) (N=80)*

No	Question	Pre-intervention		Post-Intervention	
		I	C	I	C
1	normal blood glucose level (RBS)	09	14	35	25
2	Normal HbA1c level	02	04	19	08
3	Diabetes outcome. (Curable/non-curable/ controlled by lifestyle modifications and medicines)	20	19	36	23
4	Effect of exercise on blood pressure and sugar	06	03	14	04
5	Type of exercise	22	19	26	19
6	Complications of diabetes (Cardiac diseases, Renal, Neurological, Foot complications, Eye complications)	00	01	07	03
7	Foot complications and sequelae	01	12	02	11
8	Importance of regular blood sugar measurement	12	03	22	06
9	Treatment during the days of fever, diarrhoea and infections	03	03	05	02
10	Eye check-up	07	18	13	11
11	Immediate symptoms of hypoglycaemia	02	01	07	02
12	Healing of wounds in diabetes	08	06	15	10
13	Medicines should be stopped once level of sugar is below 140 mg% /regular doctors visits helps in drugs dose regulation/ those who take medicines doesn't need to take care of their diet.	16	14	24	21
14	How would you tackle an attack of hypoglycaemia?	06	09	26	13
15	How do you feel about including following food items in your diet?	05	02	09	03
16	What type of exercise one should do in terms of duration, type and frequency?	24	29	34	28
17	How should a diabetic patient take his diet in terms of quantity, frequency and amount?	07	18	18	14
18	Takes drugs/insulin regularly?	23	21	39	31
19	Alcohol addiction	34	39	34	39
20	Smoking addiction	34	35	38	35
21	Do you do exercise regularly?	00	00	17	05
22	Kcal in a daily diet (<30kcal/kg)	06	08	23	11
23	% of fat in a diet (<20% of total calorie intake)	38	39	39	38
24	Regular blood sugar check-up?	40	40	40	40
Total correct responses = 960		325	357	542	402

complications of Diabetes as well as management of hypoglycaemic episodes. Awareness about these aspects showed an increase at 4 months in both intervention and control group. Patients in both the groups at 0 months had knowledge about different types of exercises but this knowledge was not implemented as none of the patients were actually doing any regular exercise. At 4 months, the number of patients doing regular exercise increased in both Intervention and Control group, with more increase in intervention as compared to control group.

An unpaired t-test was applied to check the difference between diet of two groups. The results showed that before intervention the amount of calories (p=0.89) and fat percentage (p=0.50) both were statistically not different between the 2 groups. But after intervention the difference with reference to total Calories (p=0.0003) and Fat percentage (0.013) became statistically significant between intervention and control group (Table 2).

Paired t-test was used to see if there is any statistical difference in the Intervention Group as well as in the Control Group with respect to total calories intake and fat %.

The difference was statistically significant for total calories intake in the intervention group. (p=0.0025).For the fat % the difference was there in the means but the paired t-test suggested that this difference was statistically insignificant. (p=0.15) (Table 3).

The difference in the Control Group in pre and post-intervention data was statistically insignificant with respect to total calories intake (p=0.82) and fat % (0.07). It is important to notice that the percentage of fat derived energy out of total energy increased in control group in second visit (Table 2).

Metabolic control of Diabetes was measured by doing Plasma Glucose measurement. For this purpose RBS, FBS and PP2BS were done. Means of Blood Glucose measurements were calculated. Paired t-test in a Control Group showed significant difference for FBS (p=0.0006) but the difference with respect to RBS (p=0.06) and PP2BS (p=0.052) was statistically insignificant. For intervention group before and after difference with respect to all three parameters RBS (p=0.0005), FBS (p<0.0001) and PP2BS (p<0.0001) was statistically significant (Table 4).

After intervention 20 participants from Intervention Group and 35 participants from the Control Group had either their FBS level above the normal levels (126 mg/dl) or their PP2BS levels above normal levels (≥200 mg/dl). While before Intervention these numbers for Intervention and Control Group were 37 and 35 respectively. Thus before intervention 92.5%

Table 2 — *Diet Comparison between Two Groups*

Pre-Intervention (Unpaired t-test)			
Diet component	Control group	Intervention group	P value
Calories Kcal	2322 ± 371	2334 ± 460	P=0.89
Fat% of total Kcal	13.89 ± 3.25	14.39 ± 3.39	P=0.50
Post-Intervention (Unpaired t-test)			
Diet component	Control group	Intervention group	P value
Calories Kcal	2344 ± 400	2056 ± 267	*p=0.0003
Fat% of total Kcal	15.09 ± 3.08	13.45 ± 2.68	*P=0.013

Table 3 — *Diet Comparison in Each Group*

Control group (Paired t-test) (n=40)			
	Before Intervention	After intervention	Paired t-test
Calories Kcal	2322 ± 371	2344 ± 400	P=0.82
Fat% of total Kcal	13.89 ± 3.25	15.09 ± 3.08	P=0.07
Intervention group (Paired t-test) (n=40)			
	Before Intervention	After intervention	
Calories Kcal	2334 ± 460	2056 ± 267	*P=0.0025
Fat% of total Kcal	14.39 ± 3.39	13.45 ± 2.68	P=0.15

participants of intervention group had poor Glycemic control and 87.5% participants of control group had poor Glycemic control.

In other words 50% patients from Intervention Group and only 12.5% patients from the Control Group could achieve good Glycemic control. Relative Risk (RR) of poor Glycemic control with respect to Counselling was 1.75. Attributable Risk (AR) of poor Glycemic control with respect to FBS in non-intervention participants was 42.86%.

Table 4 — *Effect of Councelling on the Blood Sugar Levels*

Before Intervention

Test	Intervention group Mean ± SD (CI)	Control group Mean ± SD (CI)	t-test
RBS (mg/dl)	259.15 ± 144.17 (213.04-305.26)	240.40 ± 90.24 (211.54-269.26)	p=0.4877
FBS (mg/dl)	178.92 ± 66.87 (139.35-187.64)	171.25 ± 51.22 (154.87-187.63)	p=0.5663
PP2BS (mg/dl)	290.35 ± 70.74 (257.02-298.00)	303.55 ± 101.24 (271.17-335.93)	P=0.5011

After Intervention

Test	Intervention group Mean ± SD (CI)	Control group Mean ± SD (CI)	
RBS (mg/dl)	174.10 ± 36.49 (162.43-185.77)	209.92 ± 47.57 (194.71-225.14)	*P=0.0003
FBS (mg/dl)	124.00 ± 22.36 (116.85-131.15)	138.37 ± 28.09 (129.38-147.36)	*P=0.0134
PP2BS (mg/dl)	205.90 ± 45.96 (191.20-220.60)	264.12 ± 75.49 (239.98-288.26)	*P=0.0001

Before and After Intervention in Intervention group

Test	Before Counselling	After counselling	
RBS (mg/dl)	259.15 ± 144.17 (213.04-305.26)	174.10 ±36.49 (162.43-185.77)	*P=0.0005
FBS (mg/dl)	178.92 ± 66.87 (139.35-187.64)	124.00 ± 22.36 (116.85-131.15)	*P<0.0001

DISCUSSION

Diabetes is a chronic, incurable condition that has considerable impact on the life of each individual patient. WHO projects that Diabetes will be the 7th leading cause of death in 2030. Healthy diet, regular physical activity, maintaining a normal body weight and avoiding tobacco use can prevent or delay the onset of Type2 Diabetes[4]. The vast majority of day-to-day care in Diabetes is handled by patients and/or families, so Counselling the patients to improve self-management should be a central component of any effective treatment plan. Educational programs with in-home reinforcement can improve the self-management of Diabetes and lead to improvement in health indicators[5].

In our study effect of Counselling the patients about self-management was measured with respect to the change in diabetic awareness, dietary patterns of the participants and Glycemic control.

Patients' level of awareness about Diabetes was measured in terms of number of correct responses to the questions in Table 1. At the end of the study period the total number of correct responses increased in both the groups, but the intervention group showed greater increase than the control group and this difference was statistically significant. This implies that Counselling did improve the patients understanding about DM especially its complications, the management of hypoglycemic episodes and the importance of doing regular exercise. Several studies using such questionnaires also reported a similar positive impact of Counselling on patients knowledge about DM and its implementation in everyday life[6-10].

At baseline patients in both intervention and control group had poor knowledge about the various complications of Diabetes as well as management of hypoglycaemic episodes. Awareness about these aspects showed an increase at 4 months in both intervention and control group. Patients in both the groups at 0 months had knowledge about different types of exercises, but this knowledge was not implemented as none of the patients were actually doing any regular exercise. At 4 months, the number of patients doing regular exercise increased in both intervention and control group with more increase in intervention as compared to control group.

Table 2 results shows that the difference between both the groups for total calories intake and % fat intake was statistically insignificant at the beginning of the study. The amount of K cal a diabetic takes during the whole day should be less than 2200 or 30 kcal/day. These means suggest that the caloric intake of participants in both the groups was on a higher side.

So the Counselling regarding this was very necessary. The energy derived from fat in these groups were within normal limits (<20%).

After the counselling the intervention group showed the improvement in terms of total energy intake (p=0.0025). But the Control Group did not show any improvement, rather the average Calorie intake slightly increased. Change in terms of fat in both the groups was not seen. And whatever change seen in an intervention was statistically insignificant in a group (p=0.15), while in the control group the % fat intake increased by a statistically significant amount (p=0.07). Since all the values of pre and post intervention for % fat intake are less than 20, we can say that the amount of energy derived was within normal limits.

Post Intervention difference between both the groups in terms of Calories (p=0.0003) and % Fat (p=0.013) was significant. Patients in the Intervention group were taking more healthy diet and they did modify their diet according to their needs. Since both groups were taking amount of fats within the recommended limits, there was still a scope for Carbohydrate reduction in some patients of the control group. Thus educating the patient about dietary changes did produce an improvement in their dietary patterns. This is similar to the results obtained in a study conducted by Krishnan D, Gururajan R, *et al* which showed that participants who received both dietary and exercise Counselling with periodic follow-up were generally likely to follow dietary principles more carefully and were more involved with their interactions with the Counsellor[11].

The effect of Counselling on Glycemic control was measured by comparing calculated means of RBS, FBS and PP2BS of the participants in both the groups. The analysis was done similar to the diet analysis. Results showed that the baseline (before Counselling) Blood Sugar in terms of RBS, FBS and PP2BS were comparable as there was no statistical difference. Paired t-test results showed improvement in all three Blood Sugar parameters in an intervention group, while the control group showed improvement in only RBS (p=0.0625) and FBS (p=0.0006) and not in PP2BS (p=0.51) levels. This might be due to improper knowledge and practice regarding the diet in a Control Group. Post intervention difference in the Blood Sugar parameters was significant for all three, RBS (p=0.0003), FBS (p=0.013) and PP2BS (0.0001). Thus there was a better Glycemic control in intervention group than Control Group (Table 3).

This is similar to result obtained in an interventional study done by Renuga E, Vanitha Rani N, *et al* in 2014 in India stated that "There was a reduction in the

mean FBS from baseline to the follow-up in both the groups but a statistically significant higher reduction in the mean FBS was found in the Intervention Group from baseline to the final follow-up when compared to the control group (p<0.001)."[12] In another study conducted by Ahmed MM, Degwy HME, *et al* statistically significant improvement was found in the mean levels of HbA1c and FBS after application of face to face diabetic education[13].

Several other studies also showed that Counselling led to better Glycemic Control measured in terms of Glycated Haemoglobin(HbA1c)levels[14-18]. A study by Norris S L, Lau J, Jay Smith J S, *et al* showed that self-management education improves Glycated Hb levels at immediate follow up and increased contact time increases the effect. The benefit declines 1-3 months after the intervention ceases, however, suggesting that learned behaviours change over time. They also stated that further research is needed to develop interventions effective in maintaining long-term Glycemic control[19].

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