Impact of Mentoring Programme for Insulin Taking Techniques for Geriatric Diabetic Patients

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Abstract

Effective patient education gradually improves knowledge, attitude, and practices leading to better glycaemic control and is widely accepted as an integral part of comprehensive diabetes care for affected individuals and their families in primary care settings. Effective patient counselling improves patient compliance towards medicines. The aim of study is to evaluate the impact of patient education in improving therapeutic outcomes of insulin therapy in geriatric patients in terms of HbA1c. Effective counselling improves knowledge, attitude, and practices, particularly with regard to lifestyle modifications and dietary management, culminating into better glycaemic control that can slow down the progression of diabetes and prevent downstream complications. So targeted individualized training in insulin taking is associated with improved glucose control and greater patient satisfaction with therapy.

This retrospective study was conducted in the department of General Medicine in Believers church medical college hospital. The study was conducted on 200 diabetic subjects on all types of insulin therapy consisting of 100 cases and 100 controls. Cases were given education and training on insulin taking technique along with their disease, drugs, dietary, and lifestyle at first

follow-up, while controls received neither of these. Subjects were assessed by giving a questionnaire and for glycaemic control by measuring glycated haemoglobin (HbA1c) at the end of the study. In this study, patient counselling showed significant increase from the baseline compared to controls, accompanied by significant reduction in HbA1C of cases at the end of the study compared to the control.

Keywords

Diabetes Mellitus (DM); Insulin therapy; Therapeutic Education.

Abstract

Effective patient education gradually improves knowledge, attitude, and practices leading to better glycaemic control and is widely accepted as an integral part of comprehensive diabetes care for affected individuals and their families in primary care settings. Effective patient counselling improves patient compliance towards medicines. The aim of study is to evaluate the impact of patient education in improving therapeutic outcomes of insulin therapy in geriatric patients in terms of HbA1c. Effective counselling improves knowledge, attitude, and practices, particularly with regard to lifestyle modifications and dietary management, culminating into better glycaemic control that can slow down the progression of diabetes and prevent downstream complications. So targeted individualized training in insulin taking is associated with improved glucose control and greater patient satisfaction with therapy.

Patients with type 1 diabetes (T1DM) require insulin therapy for their lifetime; and the majority of patients with type 2 diabetes (T2DM) will require insulin therapy over time, due to the progressive decline in β-cell function. Diabetes education, especially in terms of proper insulin injection techniques, takes a
great deal of time and effort. Without it, however, the right type of insulin at the right dose might not necessarily give the right results. As a consequence, marked glycaemic excursions could occur and optimal blood sugar control could prove to be elusive. [3]

Importance of Education in Diabetes

Therapeutic patient education is a patient-centred approach, focussed on patients' needs, resources, values and strategies. It allows patients to improve their knowledge and skills not only concerning their illness but also their treatment. The ultimate goal is to enable and empower patients to participate actively in their treatment and prevent avoidable complications, while maintaining or improving the quality of life.[4] According to Diabetes Control and Complications Trial study in 1993.[5] which demonstrated that strict metabolic control along with a structured diabetes education program prevented a considerable percentage of chronic complications from diabetes. The ultimate aim of education is disease curance, proper understanding about the disease pattern, its etiological characteristics and treatment regimen. Thus therapeutic education is part of a humanistic medical approach centred on patients; it allows them to be active participants in their own treatment with the aim of improving their quality of life and therapeutic compliance, as well as reducing potential complications. Therapeutic Education should set Educational objectives for each of these stages, facilitated by the continuous evaluation of both the process and the results between the healthcare team and the patients and families. This assessment should be systematic and permanent, with the purpose of optimizing the goals of metabolic control and therefore the patient's quality of life.[6]

Therapeutic Education Comprises Many Parts Involving

- ➢ Diet patterns
- ➢ Physical Activity
- ➢ OAH Information
- ➢ Insulin taking Techniques
- ➢ Diabetes Information

Incorrect administration of insulin can result in transient and serious hypo- and hyperglycemia, wide glycaemic excursions, and diabetic ketoacidosis. When glycemic control is poor, patients and providers commonly assume that this is because of poor behavioural adherence (e.g., insulin omission), dietary indiscretions, difficulties using carbohydrate counting or sedentary lifestyle.[7] However, in an analysis of insulin errors that resulted in emergency department visits for hypoglycemia, in addition to "intentional" errors, the authors identified other insulin errors, including "unintentionally took wrong insulin product," "meal-related misadventure," "pump-related misadventure," and "other misadventure".[8] Untreated heart disease increases the risk of heart attack.[9] Proper injection technique is important to improve glycaemic control, decrease the risk of hypoglycaemia, and reduce lipohypertrophy.[10]

Factors Affecting Insulin Action

Several factors can affect how insulin is absorbed.

- ➢ **Dose of insulin injected:** The dose of insulin injected affects the rate at which your body absorbs it. With larger doses of insulin, the insulin may peak later or last longer than with small doses. This could mean that your blood sugar level is higher than expected within a few hours after eating but then becomes low.

- ➢ **Injection technique:** The angle and depth of an insulin injection are important, as mentioned above.

- ➢ **Site of injection:** Clinicians usually recommend changing your injection site to minimize tissue irritation. However, it is important to keep in mind that insulin is absorbed at different rates in different areas of the body. Insulin is absorbed fastest from the abdominal area, slowest from the leg and buttock, and at an intermediate rate from the arm. This may vary with the amount of fat under the skin; the more fat, the more slowly insulin is absorbed.

- ➢ **Subcutaneous blood flow:** Any factor that alters the rate of blood flow to the body's tissues will alter insulin absorption. Smoking decreases blood flow to the tissues and decreases absorption of injected insulin. In contrast, factors that increase the skin temperature (such as exercise, saunas, hot baths, and massage of the injection site) will increase insulin absorption.

- ➢ **Time since opening the insulin bottle or pen:** In general, insulin bottles (vials), pens, and pen cartridges are good until their expirations date, if left unopened in a refrigerator. Insulin should never be allowed to freeze or get hot. Once an insulin bottle (vial) is opened, it should be kept at room temperature or in the refrigerator for 28 to 30 days and then discarded.

- ➢ **Individual factors:** The same dose of the same type of insulin may have different effects in different people with diabetes. Some trial and error is usually necessary to find the ideal type(s) and dose of insulin and schedule for each person.(11)

Guidelines for insulin therapy to achieve glycaemic targets

- ➢ Continuous intravenous insulin infusions are recommended in critical care to achieve glycaemic targets. Infusions can also be used for management

in noncritical care areas forpatients meeting established criteria. When intravenous insulin is discontinued, the transition to scheduled subcutaneous insulin should occur 1-2 hours before the infusion is discontinued. (11,12)

➤ Scheduled subcutaneous basal, prandial, and correction insulin orders are preferred, rather than 'sliding scale' alone, for non-critically ill patients. (11,12) It is particularly important that patients who were receiving insulin at home receive scheduled insulin as inpatients. Intravenous insulin therapy alone for patients who are eating meals does not control blood glucose very effectively. In situations where intravenous insulin is given to patients who are eating, subcutaneous insulin to cover carbohydrate ingestion can be used to manage meal-related glucose variability.

➤ Use of oral antihyperglycemic agents is of limited value, may be potentially harmful in acute care settings, and should be avoided. (11,12).

➤ Use of insulin in acute care should be explained to patients to avoid unnecessary anxiety concerning use of insulin therapy after discharge. (13)

➤ Insulin therapy adjustments should be made considering response to insulin doses, type of diabetes, current A1C, nutritional status including carbohydrate intake, clinical status (such as weight and renal function), insulin resistance, and concomitant medication therapy. (11,12,13)

➤ Patients transitioning to insulin therapy for home use (especially those who are new to using insulin) should begin to self-administer insulin as soon as possible under supervision in order to assess the patient's ability. Hospitalization is an opportunity to evaluate and improve home diabetes medication regimens and promote self-care. (11)

Need for the Study

Diabetes mellitus is a common metabolic disorder with a high prevalence in developing countries and insulin therapy is the cornerstone treatment for diabetic patients. Insulin administration errors are common and may pose a significant risk to the life of the patient. It has been estimated that the number of diabetes sufferers in the world will double from the current value of about 190 million to 325 million during the next 25 years. It is a frequently encountered condition among elderly, however, it is usually poorly controlled among geriatric diabetic patients. In the United States, patients over 60 years of age constitute more than 40% of the diabetic population. (14) Geriatric patients are particularly at higher risk, especially those with low literacy and knowledge of self-care to control their blood glucose levels. (15) The prevalence of Diabetes is increasing in elderly. In view of comorbidities present in elderly diabetics the approach to manage diabetes in them varies significantly from that of the younger population. The study is conducted to evaluate the impact of patient educational intervention on reducing the errors that are related to inappropriate administration and storage of insulin. (16, 17, 18)

Aim

➤ To evaluate the impact of patient education in improving therapeutic outcomes of insulin therapy in geriatric patients in terms of HbA1c.

Methodology

Study Design: A hospital based Retrospective Study.

Study Site: The study will be conducted at Believers Church Medical College Hospital (BCMCH), Thiruvalla in the General Medicine Department.

Study duration: The study will be carried out for a period of 6 months from November 2019 to April 2020

in the in-patient department of the General medicine department of BCMCH.

Sample Size: The sample size has been calculated by the formula $n=((z2*p(1-p))/e2)/1+((z2*p(1-p))/Ne2)$

Study Approval: This study was approved by the Institutional Ethical Committee of BCMCH, Thiruvalla

Study criteria: The study will be carried out by considering the following criteria:

Inclusion Criteria

➢ Patients on all types of insulin therapy.

➢ Patients with uncontrolled diabetes even after routine education.

➢ Patients who are highly motivated or those with highly motivated care givers will be given intervention. Those unwilling for education on injection technique will be the controls.

Exclusion Criteria

➢ Patients on insulin therapy for less than 1 month will be excluded.

Sources of data: All relevant and necessary data will be collected from

➢ Patient case notes

Materials: The materials required for this study are

➢ Data collection performa

➢ Pre Designed questionnaires

➢ Informed consent form

Study Procedure and Study Variables

The data will be collected by visiting the general medicine department and enter it in the predesigned data collection performa, thereby analysing the current knowledge regarding insulin taking techniques. After assessing the patient's knowledge, the next aim is to provide counselling on Insulin taking techniques, Diet, Exercise. The final step is to evaluate the impact of patient education by assessing HbA1c, FBS & RBS level. Informed consent will be obtained from all participants prior to their inclusion into study.

➢ Demographic profile: Name, Age, Gender, Weight, Date of prescription.

➢ All details regarding diagnosis, comorbidities.

➢ Details of Insulin therapy : Name, Dose ,Type of insulin ,Type of device

The study is expected to complete in about 6 months. The proforma however is subject to modification if required, after initial study. Personal data of entire individual patients will be kept confidential. Informed consent will be obtained from all participants prior to their inclusion into study. All the participants will be given a brief description regarding the study procedure and confidentiality of data prior to obtaining written consent.

➢ **Data Collection Tool** : Predesigned data collection form which has been validated (Annexure-1).

➢ **Data Analysis** : The data collected were entered in Microsoft excel -2010 version and results were presented in tabular form and presented as frequency and percentages.
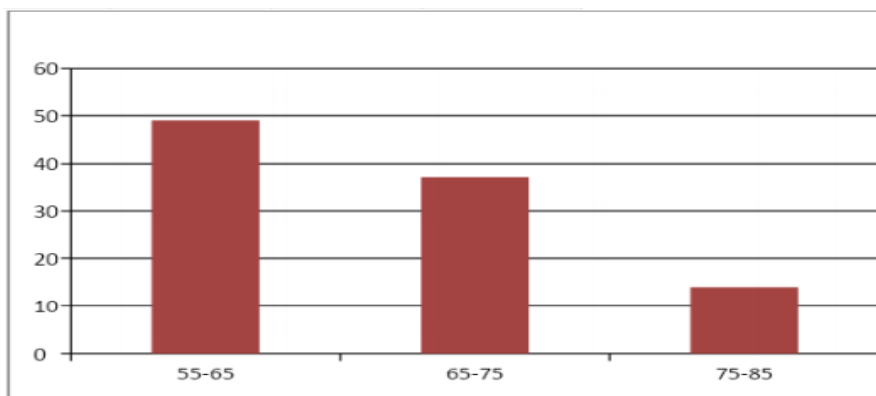
Result

Subjects Enrolled in the Study

S. No.	Subjects Group	1ST Visit(Before Counselling)	2ND Visit(After Counselling)
1	Educated Patients	100	90

1. **Distribution of Age Group**

| S. No.	Age Group	Frequency	Percentage
1	55-65	44	49
2	65-75	33	37
3	75-85	13	14
	Total	90	100

Fig 1: Distribution of Age Groups.

Fig-1 shows the age group distribution of the patients. The total population of 100 were divided into 3 groups. Elderly groups of ages 55-65, 65-75, 75-85. The highest value was observed in the first group.

2. **Distribution of Gender**

S. No.	Gender	Frequency	Percentage
1	Male	45	50
2	Female	45	50
	Total	90	100
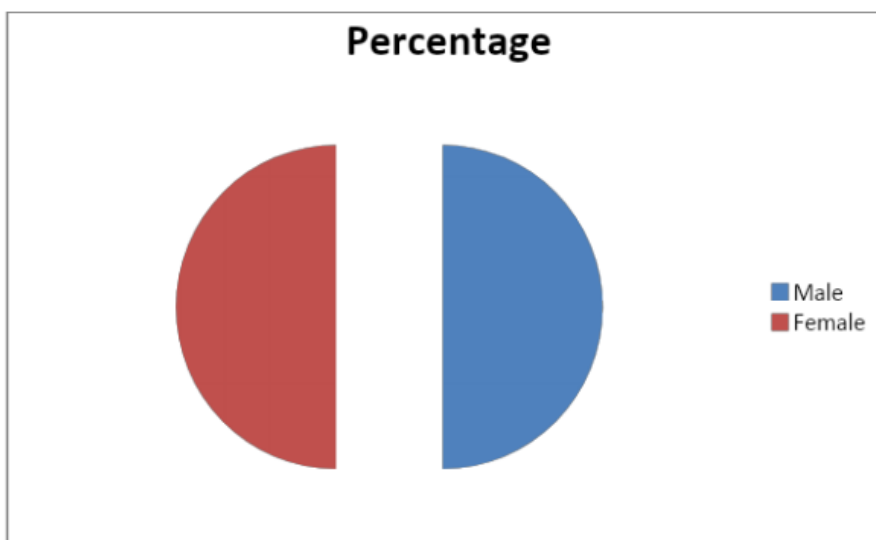
Fig 2: Gender Distribution

Fig 2 demonstrates the gender distribution of the patients in the study group. The study group consists of males (57%) and females (43%).

3. Distribution of Drugs

Distribution of patients who are taken only insulin

S. No	Type	Frequency	Percentage (%)
1	Intermediate acting	1	50
2	Long acting	1	50
	Total	2	100

Table 3: Distribution of Insulin usage patterns

Table 3 demonstrates that the Intermediate acting Insulin and Long acting were used by the subjects in equal percentages.

4. Distribution Of Lab Parameters

Table 4: Distribution of lab parameters

| S. No.	Lab Parameters	Stages	Range	Before Counselling	After Counselling
1	PPBS	Normal	Less than 140mg/dl	0	2
		Pre-diabetes	140-199 mg/dl	2	23
		Diabetes	>/=200 mg/dl	88	65
2	FBS	Normal	Less than 100 mg/dl	0	3
		Pre-diabetes	100-125 mg/dl	1	26
		Diabetes	>/=126 mg/dl	89	61
3	HbA1c	Normal	Less than 5.7%	0	1
		Pre-diabetes	5.7% - 6.5%	1	15
		Diabetes	>/= 6.5%	89	74

Table 4 demonstrates that In the case of PPBS, after counselling the percentage of subjects who had normal range was increased to 2% and those who had diabetics was reduced to 65% from 88%.

In the case of FBS, after counselling the percentage of subjects who had normal range is increased to 3% and those who had diabetics is reduced to 61% from 89%.

In the case of HbA1c, after counselling the percentage of subjects who had normal range is increased to 1% and percentage of subjects who had diabetics is reduced to 74% from 89%.

5. Which Device You Normally Used To Inject?

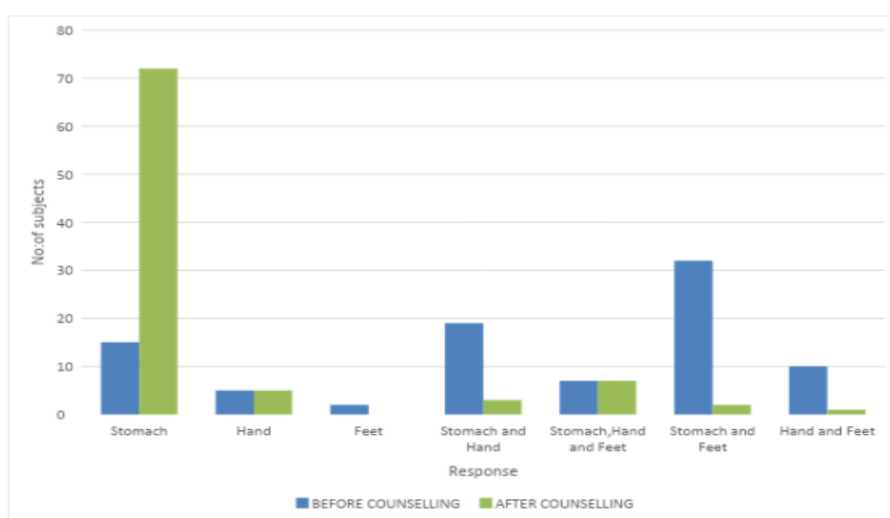| S. No.	Device	Before Counselling	After Counselling
1	Syringe	59	50
2	Pen	31	40
3	Pump	0	0
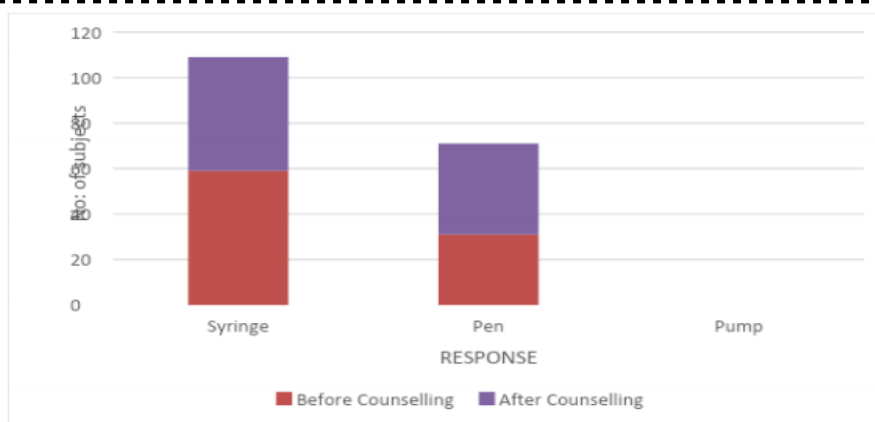
Fig 3: Device used to inject

Fig 3 shows that before counselling, Syringe was the commonly used device for injecting insulin (59%) and usage of the pen was about 31% but after counseling, it shows that the usage of syringe decreased to about 9% and the use of pen increased to 9%.

6.   Which Injection Sites Do You Use?

| S. No.	Sites of injection	Before Counselling	After Counselling
1	Stomach	15	72
2	Hand	5	5
3	Feet	2	0
4	Stomach and Hand	19	3
5	Stomach, Hand and Feet	7	7
6	Stomach and Feet	32	2
7	Hand and Feet	10	1

Fig 4: Sites of Injection.

Fig 4 demonstrates that the stomach and feet were the most commonly used injection sites before counselling and the stomach was found to be the highest site after counselling.

7. When Do You Give Your Injection?

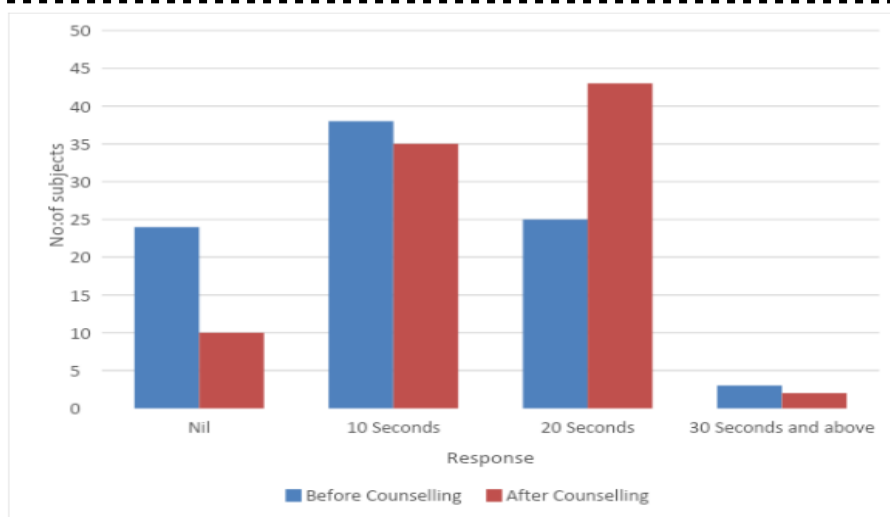| S. No.	Response	Before Counselling	After Counselling
1	Morning	10	15
2	Afternoon	1	1
3	Night	4	3
4	Morning, Noon and Night	5	5
5	Morning and Night	70	66
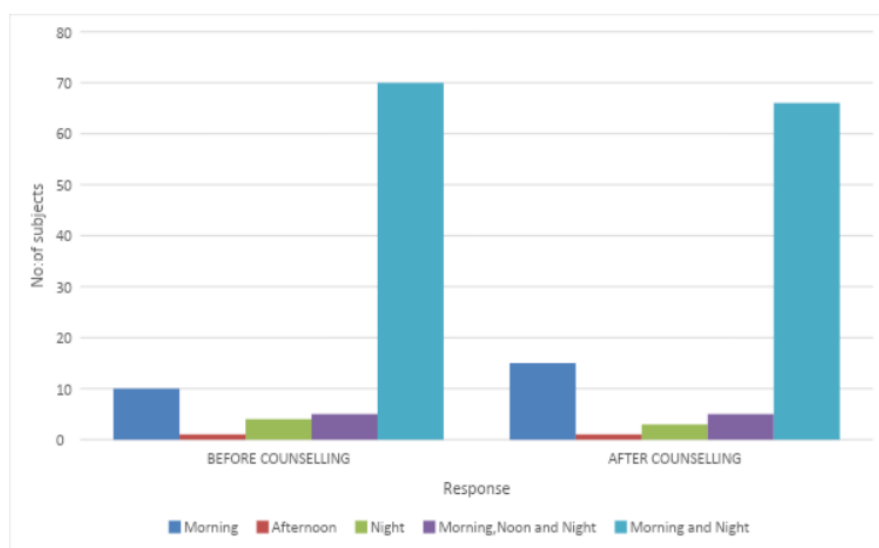
Fig: 5 Time of injection

Fig 5 demonstrates that among 90 samples enrolled in the study, 66% of subjects were taking insulin both morning and night, and only 1% of subjects were taking in the afternoon.

### 8. How Long Do You Leave The Needle In The Skin After The Injection?

S. No.	Response	Before Counselling	After Counselling
1	Nil	24	10
2	10 Seconds	38	35
3	20 Seconds	25	43
4	30 Seconds and above	3	2

Fig 6: Duration of needle in the skin after injection. Fig 6 shows that before counselling the number of patients who leave the needle correctly (20 sec) in the skin was about 25 % and after counselling the number of patients who leave the needle in the skin were increased to 43%.

9. Does the Injection Cause Bleeding or Bruising or Pain?

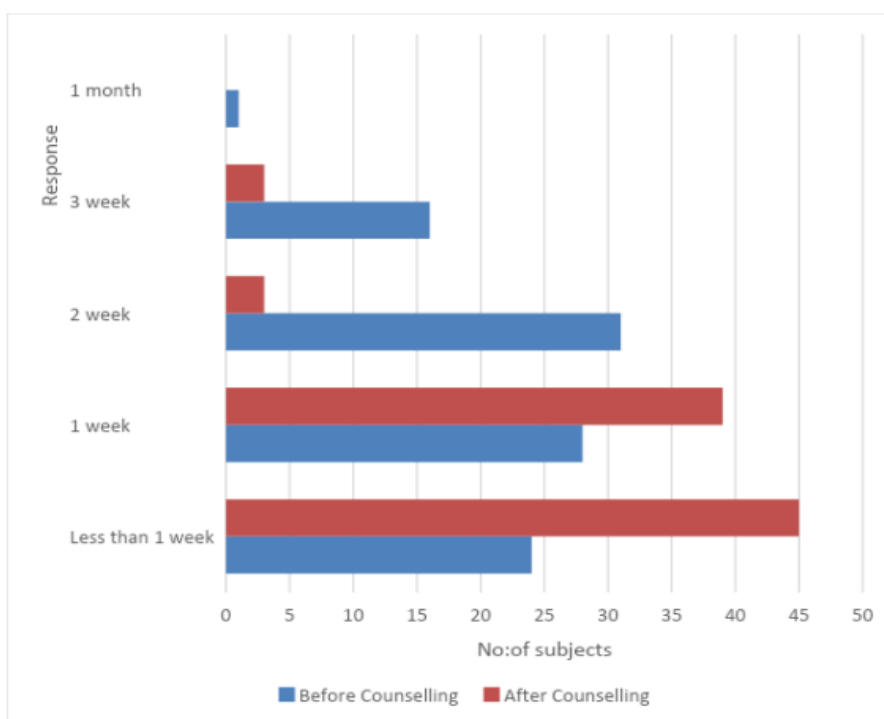| S. No.	Response	Before Counselling	After Counselling
1	Bleeding	1	0
2	Blushing	1	0
3	Pain	60	32
4	Nil	27	58
5	Bleeding and Pain	1	0
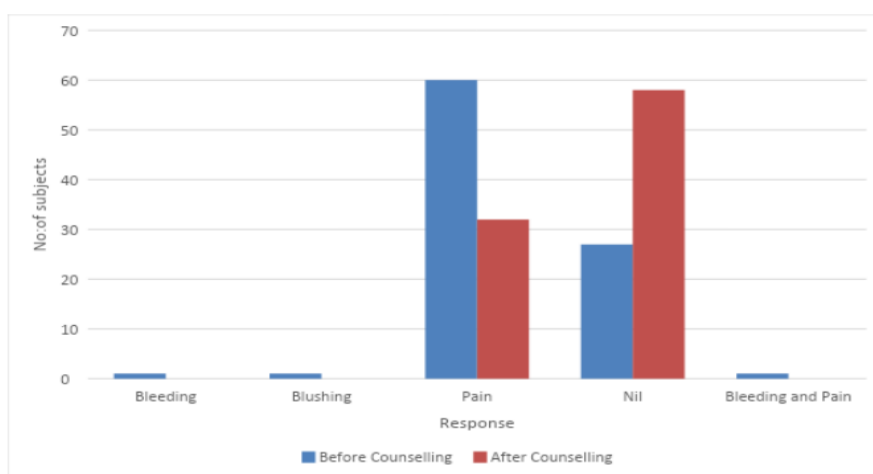
Fig: 7 Complications of injection

Fig 7 demonstrates that the most commonly experienced injection site side effect was pain in about 60% and the least was bleeding and blushing (1%) and after counselling the pain rate decreased to 32%.

10. How Often Do You Use The Same Needle?

| S. No.	Response	Before Counselling	After Counselling
1	Less than 1 week	24	45
2	1 week	28	39
3	2 week	31	3
4	3 week	16	3
5	1 month	1	0

Fig 8: Repeated use of same needle

Fig 8 shows that before counselling out of 90 population only 24 % are changing needle correctly after injection but after counselling it has increased to 45%.

11. At What Angle Do You Insert The Needle ?

| S. No.	Angle	Before Counselling	After Counselling
1	40	8	2
2	90	76	88
3	Others	6	0
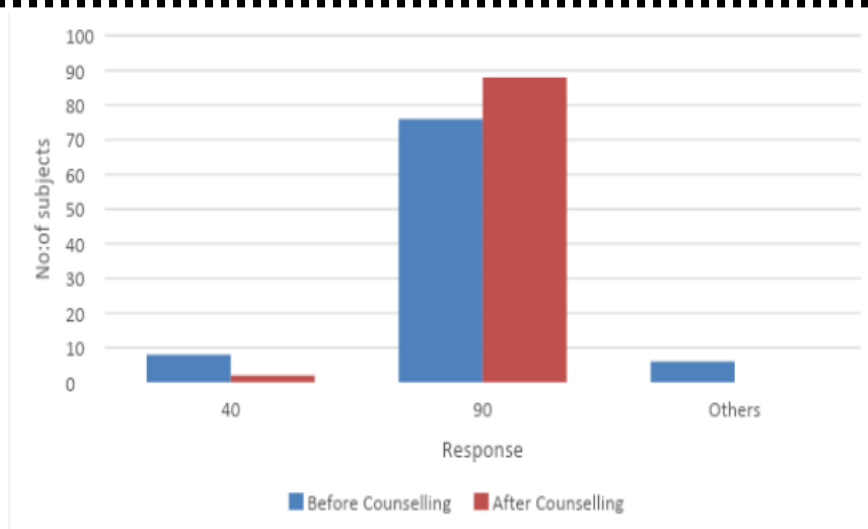
Fig 9: Angle of needle during injection

Among 90 subjects enrolled in the study, About 76 patients injected their insulin at 90 degree (which is the exact angle for inserting insulin). But after counselling the number of patients who injected at 90 degree increased to 88.

12. Insulin Taking Techniques

A. Storage

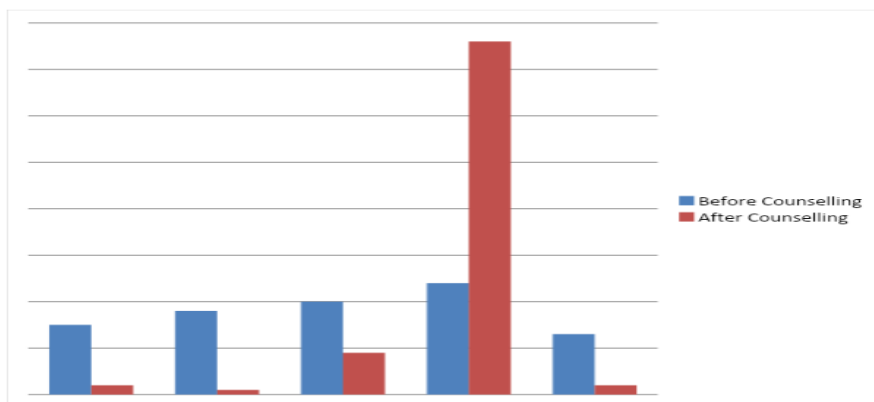| S. No.	Storage	Before Counselling	After Counselling
1	Refrigerator	87	90
2	Outside	3	0
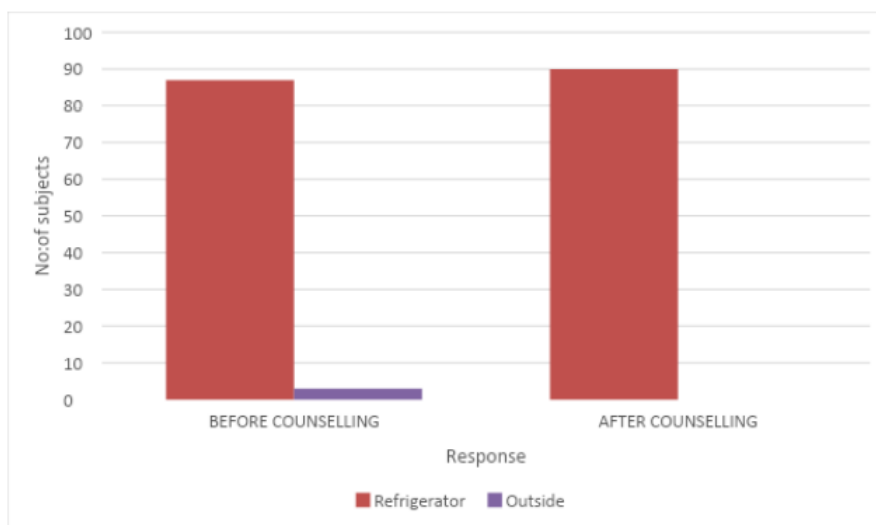
Fig 10: Storage of insulin

Among the 90 cases evaluated in the study, all the 90 subjects followed the correct technique of storing the Insulin at refrigerator.

B. Time Interval Between Injection And Meal

| S. No.	Time Interval	Before Counselling	After Counselling
1	Nil	15	2
2	10 minutes	18	1
3	20 minutes	20	9
4	30 minutes	24	76
5	Above 40 minutes	13	2

Fig: 11 Time gap between injection and meal

Fig 11 demonstrates that the time interval between insulin injection and meal vary between 0 min, 45min and above, before counselling only 24% were maintaining proper 30 min interval, but after counselling it has increased to 76%.

C. Hand washing Prior To Injection

| S. No.	Hand washing prior to injection	Before Counselling	After Counselling
1	Yes	40	88
2	No	50	2
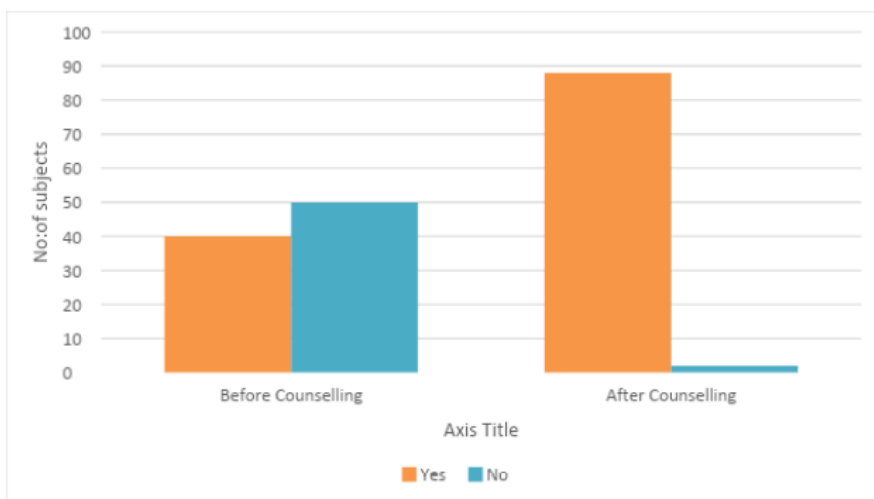
Fig: 12 Hand washing prior to injection

Among 90 study population enrolled in the study, 88 of subjects washed their hand after using insulin which was only 40 before counselling.

D. Cleaning of Injection Site

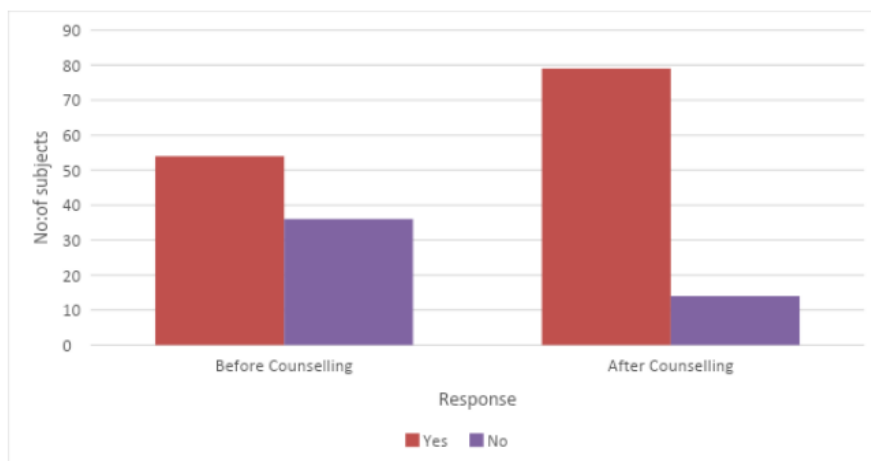| S. No.	Cleaning of injection site	Before Counselling	After Counselling
1	Yes	26	80
2	No	64	10
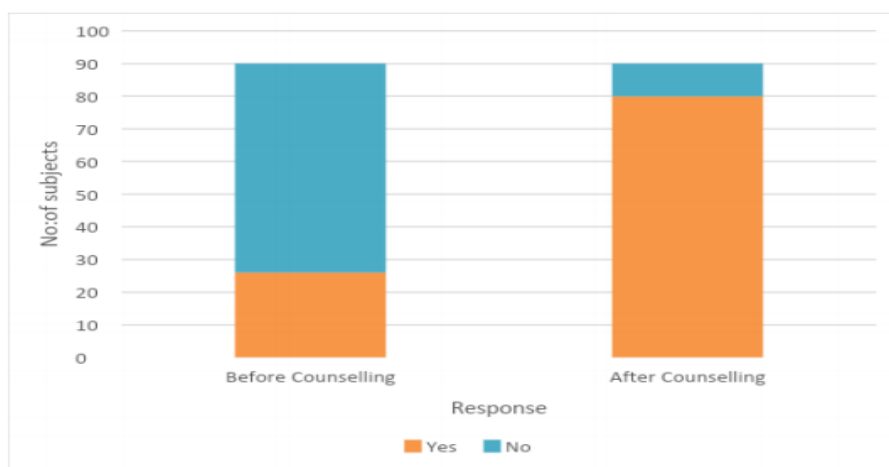
Fig: 13 cleaning of injection site

Fig 13 demonstrates that before counselling the number of patients who did cleaning of injection site was 26 and after counselling it has increased to 80.

E. Mixing of Injection and Priming Prior To Use

S. No.	Mixing of injection and priming prior to use	Before Counselling	After Counselling
1	Yes	54	79
2	No	36	11

Fig :14 Mixing of injection and priming prior to use Fig14 shows that before counselling the number of patients

who did mixing of injection and priming were 54 and after counselling it has raised to 79.

F.   Massaging of Injection Site

| S. No.	Massaging of injection site	Before Counselling	After Counselling
1	Yes	9	1
2	No	81	89
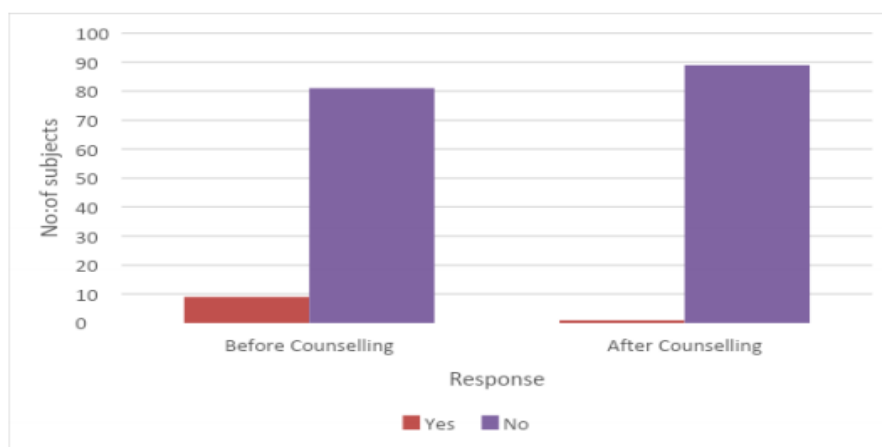
Fig: 15 massaging of injection site

Fig 15 shows that before counselling 9 of the subjects did massaging of the injection site whereas 81 subjects didn't

but after counselling the number of subjects who didn't massage increased to 89 which is the correct method.

Means of Pre-Test and Post-Test

Test	Mean	SD	T Value	P Value Sig
Pre-test	2.458	2.045	5.216	0.004(S)
Post –test	6.621	1.451	48.161	0.001(HS)
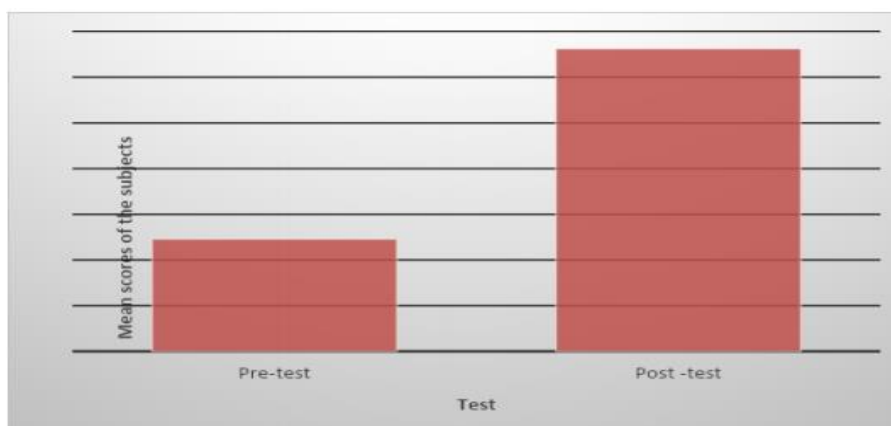
Fig 16: Pre Test and Post Test

This fig shows that after counseling, a large variation experienced in the T value. ie. T value was 5.216 before

counseling, but it has increased to 48.161 post test.

Discussion

The primary objective of the study was to evaluate the impact of patient education in improving therapeutic outcomes of insulin therapy in geriatric patients in terms of HbA1c. According to the study done by Chaudhary Muhammad Junaid Nazar et.al, Better diabetic education and knowledge to control and treat diabetes at right time can minimize the chances to develop complications of diabetes and thus reduce morbidity and mortality in diabetics. The desired effect is able to achieve only after correct and proper insulin administration methods. If the patient is provided with right drug, the next step is the proper administration and handling methods. Our study aims at providing diabetic education in all aspects to control diabetes. (21)

As explained in the study done by Nasir T Wabe, et.al, According to Worldwide, patient's medication adherence rate varies from 36 to 93%. Adherence to prescribed medication is crucial to reach metabolic control as non-adherence with drugs can cause higher increase of HbA1c level with associated complications. The study was conducted in Southwest Ethiopia where Non Adherence was the first most problem. The main external challenge of Non Adherence was financial problem. The study have shown that majority of the patients with type 2 diabetes in Southwest Ethiopia are managed with OHA monotherapy. At the end of the study, only less than half of the patients achieved targeted glycaemic level and majority are still not meeting the recommended blood glucose target. (22) Our study was conducted on 200 diabetic subjects on all types of insulin therapy comprising of 100 cases and 100 controls. Cases were given education and training on insulin taking technique along with their disease, drugs, dietary, and lifestyle at first follow-up, while controls received neither of these.

Subjects were assessed by giving questionnaire and for glycaemic control by measuring glycated haemoglobin (HbA1c) at the end of the study. In this study, patient counselling showed significant increase from the baseline compared to controls, accompanied by significant reduction in HbA1c of cases at the end of the study compared to the control. Majority of the people were following improper techniques in insulin administration which was rectified by counselling. Poor adherence with the prescribed drug regimen and poor knowledge and practice of successful self-management are the main reasons for not achieving glycaemic controls in majority of the patients. Geriatric patients are particularly at high risk especially those with low literacy and knowledge about insulin taking techniques and selfcare to control their blood glucose level. Poor glycaemic controlling these patients may stem from lack of literacy, cognitive impairment, poor vision, and hearing defects.

Age and Gender

Among the 90 study subjects enrolled in the study, 50% were males and were within the age group of 60-80 years and females with equal range about 50%. The most important demographic change to diabetes prevalence across the world appears to be the increase in the proportion of people 65 years of age and the prevalence of diabetes is higher in men than women according to study conducted by Sarah Wild et.al. (23)

According to Anna Nordström Et al, The prevalence of type 2 diabetes was 14.6% in men and 9.1% in women. Mean BMI was slightly higher in men than in women, with a greater difference in mean visceral fat mass. (24)

Lab Parameters

Glycaemic control in diabetes mellitus is a cornerstone in reducing morbidity and mortality of the

disease. Achieving glycaemic control or reducing hyperglycemia significantly decreases the microvascular and macrovascular complications of diabetes. Even though measurement of glycated haemoglobin (HbA1c) remains the gold standard for assessment of glycaemic control, there is no consensus whether fasting or postprandial plasma glucose (PPG) is a better predictor of glycaemic control in resource-poor settings when HbA1c is not available. According to study conducted by Ezra Belay Ketema Et al, the aim of this systematic review and meta-analysis was to summarize evidences on the significance of fasting and postprandial plasma glucose, and their correlation with HbA1c. Control of plasma glucose in patients with diabetes can be assessed by measurement of glycated hemoglobin (HbA1c), fasting plasma glucose (FPG), and postprandial plasma glucose (PPG). However, still measurement of HbA1c level remains the gold standard for assessment of glycaemic control at follow up. The concentration of HbA1c predicts diabetes complications because it reflects more harmful glycation sequelae of diabetes, such as retinopathy and nephropathy, which are understood to be due to harmful advanced glycation end products. (25)

Insulin

Insulin is often used in patients when the oral anti diabetic drugs fails to control diabetes. Basal insulins, which include long-acting insulin analogues or human intermediate-acting insulin (neutral protamine Hagedorn [NPH] insulin), are given 1–3 times a day according to their pharmacokinetic (PK) properties to control glucose levels in the fasting state and between meals. Andrej Janez et al. Intermediate acting and long acting use is about 50% in the study (27)

Insulin Injection Site

Among the 90 subjects enrolled in the study, 15% opted abdomen as their site of injection before counselling which increased to 72% after counselling. As explained in the study done by ABM Kamrul-Hasan et.al, abdomen was the most frequent site of injection, followed by arm (16.8% and 27.3%) thighs were less commonly. (26)

Insulin Device

Device commonly depends upon patient's financial background and willingness. All our study subjects were Insulin Injectors, Majority of the subject preferred Syringe (59%) as it is affordable but painful than Insulin Pen (31%) which is similar to the study done by ABM Kamrul-Hasan et.al. The study was conducted in different centres of Bangladesh to determine the Insulin taking techniques among people in the year 2018.(26)

Duration of Needle in the Skin

In our study, before counselling the number of patients who leave the needle correctly (20sec) in the skin was about 25 % and after counselling the number of patients who leave the needle in the skin were increased to 43%. This is similar to that of the study done by ABM Kamrul-Hasan.et.al where the dwell times of the needles after injections were 10 seconds in 7.7% (65/847); 13.3% (113/847) of the study subjects were not aware of the duration of needle dwell time after injections. (26)

Complications of Injection

In our study the most commonly experienced injection site side effect was pain in about 60% and the least was bleeding and blushing (1%) and after counselling the pain rate decreased to 32%. This is similar to that of the study done by Poudel.et.al, where there Nearly one-third of (13, 30.2%) them reported

complication of insulin injection technique and most common complication was bruising (10, 76.9%). Other complications were bleeding (1, 7.69%), pain (1, 7.69%). (20)

How Often Do You Use the Same Needle?

In our study, before counselling out of 90 population only 24 % are changing needle correctly after injection but after counselling it has increased to 45%.But the remaining 55% are reusing needle. This is similar to that of study conducted by ABM Kamrul-Hasan.et.al, whereas Most (98.8%) of the syringe users reused the syringes, the frequency of reusing pen needles was 98.5% among the pen users. A total of 40.7% of the syringe users and 38.9% of the pen users reused the needles >10 times. The reasons given for reusing needles were to save money (49.3%), for convenience (39.7%), not knowing how many times needles can be used (21.9%), to prevent excess waste (14.7%), and unavailability of another syringe/pen needle (3.0%). (26)

Angle of Needle during Injection

Among 90 subjects enrolled in the study, About 76 patients injected their insulin at 90 degree (which is the exact angle for inserting insulin). But after counselling the number of patients who injected at 90 degree increased to 88. This is similar to that of study conducted by ABM Kamrul-Hasan.et.al, whereas the angles of needle entry were 45 degrees in 27.7%, 90 degrees in 64.6%, and ≤30 degrees in 4.8% of the subjects. (26)

Storage

About 90% of subjects followed the correct technique of storing the Insulin at refrigerator. This is similar to that of the study done by Poudel. et.al, where the assessment of insulin injection technique and insulin pen storage practice revealed that twenty (46.5%)

patients were storing their insulin pen (insulin cartridge inside) at room temperature and an equal number of patients kept their insulin pen inside refrigerator. (20)

Time Interval between Injection and Meal

About 76% of subjects follow correct time gap (20-30min) between injection and meal. This is similar to that of the study done by Poudel.et.al, where the median (IQR) time gap between injection and meal was (15–30) minutes.(20)

Hand Washing Prior to Injection

About 88 of subjects washed their hand prior to injection. This is similar to that of the study conducted by Poudel, Ramesh Sharma Shrestha. et.al, where Thirty-one (72.1%) patients or their relatives followed the practice of hand washing before injection. (20)

Cleaning of Injection Site

About 80% of the patient enrolled in the study clean their injection site prior to the injection. This is similar to that of the study done by ABM Kamrul-Hasan.et.al, whereas the frequencies of the subjects cleaning the injection sites always, often and sometimes were 43.2%, 3.3%, and 19.7%, respectively. (26)

Massaging of the Site

About 89% of the patient enrolled in the study didn't massage the injection site. This is similar to that of the study done by Poudel, Ramesh Sharma Shrestha. et.al, where About one in five patients (9, 20.9%) mentioned that they massage the injection site after administration of insulin. All the others don't massage the site after injection.(20)

Conclusion

➢ Diabetes mellitus is a lifelong condition that can be controlled with lifestyle adjustments and medical treatments.

➢ Keeping blood sugar levels under control can prevent or minimize complications. Insulin

treatment is one component of a diabetes treatment plan for people with type 1 diabetes.

➢ Diabetic Education is an integral part of insulin therapy. Patients should be educated about disease condition, diet, exercise, complications and information on storage of insulin, use of syringes, mixing of insulin, timing of injection and meals, selection of proper site and proper technique of injection.

➢ Patient education, proper evaluation, Diet and lifestyle changes can help keep your blood sugar at a normal level and prevent other problems, such as blindness kidney damage and even serious other complications.

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Abbreviations

1. DM : Diabetes Mellitus
2. NCD : Non communicable disease
3. CVD : Cardiovascular diseases

4. FBS : Fasting Blood Sugar

5. PPBS : Post Prandial Blood Sugar

6. HbA1c : Glycated Haemoglobin

7. WHO : World Health Organisation.

8. NPH : Neutral Protamine Hagedorn

9. OHA : Oral Hypoglycemic agents

10. BMI : Body Mass Index

11. SGLT2 : Sodium Glucose Co-Transporter 2 Inhibitors

12. DPP-4 : Dipeptidyl peptidase-4 inhibitors

13. LDL : Low density Lipoproteins

14. HR QOL : Health related Quality of life

15. KAP : Knowledge, attitude and practice :