

Effectiveness of Training Session in Improvement of Insulin Administration Technique in Diabetic Patients

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Abstract:

Objective: To evaluate the effectiveness of training session in improvement of insulin administration technique in diabetic patients.

Methods: The cross-sectional analytical study was conducted in Department of medicine Abbas Institute of Medical Sciences Muzaffarabad from April 2017 to August 2017. 100 patients were recruited for study interviewed regarding their knowledge and practices of insulin injection. Patients with incorrect injection technique were observed during administration of insulin injection. Education session was conducted and patients were given feedback about their mistakes. The injection technique was re-observed after the education session and follow up with same set of questions was made in same session.

Results: The injection technique was incorrect in 26%, partially correct in 54% and correct in 18% of patients before education session. After the education session injection technique was correct in 92% of patients. It was partially correct in 8% while no patient had incorrect technique. These results were statistically significant ($p < 0.001$) when compared with one sample t-test.

Conclusion: Few minutes of teaching and guidance by health care professionals brings remarkable change regarding patient's awareness for correct application of insulin injection technique.

Keywords: Diabetes Mellitus, Insulin injection technique.

Introduction

The prevalence of diabetes is rising exponentially across the globe and according to the 8th edition of IDF atlas, published in 2017, there are about 424.9 million people aged between 20-79 years living with diabetes in the world. Insulin therapy is indicated in type-1 diabetes mellitus (DM) as well as in type-2 DM in case of secondary failure of oral hypoglycemic drugs. Insulin injections are lifesaving in the management of type-1 DM and most patients ultimately require insulin therapy in type-2 diabetes mellitus.² Diabetic patients using injections with poor injection technique, usually have variable glucose levels that result in suboptimal Glycemic control.³ We observed important issues in diabetic patients related to correct insulin injection technique and disposal of used syringes.

These include improper filling of insulin syringes, misalignments of needles in accordance to subcutaneous tissue thickness, leakage, choice of injection site and its rotation, pinching of skin fold and finally throwing used syringes in regular bins. Some of these issues are directly related to impaired insulin absorption and hence blood glucose level, local area pain and bruising.⁴ Others, for example throwing used syringes in garbage may become a source of hazard to children, sanitary workers, animals and birds.

The prevalence of diabetes in Pakistan has been estimated to be 12.14% in males and 9.83% in females.^{5,6} According to a survey by the Baqai institute of Diabetology and Endocrinology, between 35 to 38 million Pakistanis are diabetics which means every 4th Pakistani above age of 20 is suffering from this condition. If we consider only one fourth of them are using insulin still it counts 9.4 million. The optimal control of diabetes in this large population is closely related to proper injection technique. Simultaneously, these patients are also producing huge medical waste in the form of used insulin syringes and vials. If a person is using syringe four times for insulin injection,

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4.7 million waste syringes are produced daily. These figures reveal a glimpse of the disease burden, medical waste and risks associated with it.

It was observed that majority of patients were not using insulin injections with proper technique. It was further observed that these patients were never educated about the proper use of insulin injections. A training session was planned for diabetic patients to educate them the proper technique of insulin injection. This study was conducted to compare the improvement in injection technique before and after the education session in this cohort of diabetic patients.

Objectives: To evaluate the effectiveness of training session in improvement of insulin administration technique and disposal of used insulin syringes in diabetic patients

Study Design: Cross-sectional analytical study.

Place and Duration of Study: Department of medicine Abbas Institute of Medical Sciences from April 2017 to August 2017.

Patients & Methods

Following criteria were used to include and exclude patients in the study.

Inclusion Criteria: Diagnosed patients with Diabetes Mellitus on self-administration of insulin injections.

Exclusion Criteria: Diabetic patients who were unable to inject insulin by themselves.

Method: 100 patients were recruited from both indoor and out-patient departments. All Patients were interviewed regarding their knowledge and practices of insulin injection and structured Performa was filled. Patients were asked about injection technique from filling of syringes, administration of insulin injection, site of injection, rotation of the site of injection and keeping the insulin syringe for reuse or disposal. Their technique of filling the syringe and administration of injection was then observed.

Education session was conducted and patients were given feedback about their mistakes. The injection technique was re-observed after the education session and follow up of with same set of questions was made in same session.

Following steps of injection technique were observed:

- 1- Loading syringe with insulin: Accurate filling of syringe with prescribed dose of insulin
- 2- Removal of air bubble
- 3- Skin pinched up: Makes lifted skin fold (where required)

- 4- Maintenance of Needle alignment during insertion and withdrawal: Needle insertion into the skin at 90° (45° in lean patients)
- 5- Storage of syringe while kept for reuse: Wraps and stores syringe (Patient describes technique and place of storage/disposal)

Following operation definitions were used in the study:

Correct Technique: Those who performed 5 out of 5 were labelled to know the correct technique.

Partially Correct Technique: Those who performed 3 or 4 steps correctly were labelled to know the partially correct technique

Incorrect Technique: Those who performed 1 or 2 steps correctly were labelled to know the incorrect technique.

Results

One hundred patients (female 64% and male 36%) participated in the study. 58% patients were from rural areas while 42% were living in urban areas. 84% patients were able to read Urdu while 6% were able to read both Urdu and English languages. 91% patients were suffering type-2 diabetes and 9 % from type-1 diabetes mellitus. 75% patients were storing their syringes in refrigerators. The most frequent sites of insulin injections were arms and abdomen (27%) followed by legs and abdomen (26%). 54% patients were rotating the injections sites regularly while 46% preferred to use single site for insulin injection (Table-1). Injection technique was first time taught by a doctor in 52% patients and by a nurse in 38% while other paramedics were involved in teaching of 9% of patients.

Table-1 Distribution of different characteristics/variables of the study

Characteristics/Variables	Number of patients (percentage %)
Gender	
Male	36
Female	64
Residence	
Rural	58
Urban	42
Reading ability of patients	
Urdu	84
Urdu/English	6
Nil	10
Type of Diabetes Mellitus	
Type-2	91
Type-1	9

Storage of insulin syringes	
Open	1
Wrapped	17
Shelf	7
Refrigerator	75
Most frequent injection sites	
Arms and legs	26
Arms only	21
Legs only	1
Abdomen	17
Arms and abdomen	28
Legs and abdomen	7
Rotation of injection sites	
Yes	54
No	46
Injection technique learned from	
Doctor	52
Nurse	38
Paramedic	9
None	1
Correct injection technique	
Before teaching session	After teaching session
Incorrect 28	Incorrect 0
Partially correct 54	Partially correct 8
Correct 18	Correct 92

The injection technique was incorrect in 28%, partially correct in 54% and correct in 18% of patients before education session.

After the education session injection technique was correct in 92% of patients. It was partially correct in 8% while no patient had incorrect technique. These results were statistically significant ($p < 0.001$) when compared with one sample t-test (Table-2).

Table-2 One-Sample Test

	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Injection technique before teaching	24.35	99	0.001	5.8	5.3	6.3
Injection technique after teaching	88.75	99	0.001	9.6	9.4	9.8

Discussion

The self-administration of insulin injection by patient is an important tool of diabetes management. Despite using insulin for a long period of time, some patients are not aware of the proper skill of administering the insulin injections. This results not only in inappropriate control of diabetes but also development of many local complications including lipodystrophy, intramuscular or intradermal injection, pain and leakage of insulin from injection site⁷. Teaching and correction of injection technique in a small education session at the spot improved injection skills of patients in this study.

The American Association of Diabetes Educators (AADE) published its recommendations in 2013 for diabetes educators which included guideline for teaching patients proper injection technique⁸. As a developing country, there are limited resources and few hospitals have specialized dedicated diabetic centers and services of the diabetic educators. The same is true for trained diabetic health professionals. The onus of teaching the insulin injection technique then lies with the physicians, general practitioners, nurses and paramedical staff.

A significant number of diabetic patients in spite of having disease for many years have incorrect injection technique which results in poor absorption of insulin and associated with local complications of injection. The study conducted by Ji Ja and Lou Q in mainland China revealed poor injection technique in patients associated with lipodystrophy, local bleeding and bruising.⁹

In our study 82% of patients had incorrect or partially incorrect technique of injecting insulin and there was potential of all complications associated with poor injection technique. The insulin must be delivered in the subcutaneous adipose tissue. For proper insulin injection patients are advised to make a lifted skin fold and insert the needle into the skin at 90° angle and 45° in lean patients. This is particularly relevant in lean patients when the anticipated distance from the skin surface to the underlying muscle is expected to be less than the needle length. A study by Chowdhury and Chakraborty also found several issues of incorrect injection technique in Indian patients.¹⁰

Celik S and colleagues used mobile phone text messages to improve the insulin injection technique in diabetic patients in Turkey.¹¹ The study sample was consisted of 221 diabetic patients. They demonstrated that their intervention was associated with improved administration of insulin injection and better

metabolic control of diabetes at 6 months. The results of this were similar to our study. They used mobile phone text messages while we had direct intervention with face to face teaching session. In our study 92% patients were able to inject insulin with recommended technique.

Spollett G and Colleagues examined the literature including some patient surveys and found lack of effective rotation of injection sites associated with high rates of lipodystrophy and poor metabolic control of diabetes.¹² The continued issues with insulin injections need more focus upon effective strategies for patient education. In our study 46% patients were not rotating injection sites with increased risk of lipo-dystrophy and decreased efficacy of insulin therapy.

It is obvious from this study that most health professionals paid little attention for patient education. The majority of patients were not properly educated by the treating physician or a by trained diabetes health educator.

One limitation of the study was that patients were interviewed and observed for their technique; mistakes were corrected and re-evaluated in the same session. They retained knowledge in their short term memory, but impact upon long term basis could not be evaluated on the basis of this study.

The study was conducted first time among local population and many important aspects of diabetes management and waste disposal were unmasked in the local community. The current practices are associated with all possible complications of poor injection technique as observed in several studies and also confer a variable risk of transfer of communicable diseases to sanitary workers and accidental injury to children.

Conclusion

Few minutes of teaching and guidance by health care professionals brings remarkable change regarding patient's awareness for correct application of insulin injection technique. There is need for trained diabetes educators to take care of increasing population of diabetic patients in our country. In the absence of these educators onus of responsibility lies with physicians and general practitioners. It is not the good prescription, latest treatment and expensive new drugs but few extra minutes of the treating physician which will make the difference and improve the injection technique with long term benefits and improvement in the health of diabetic patients.

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