

DOI: <https://dx.doi.org/10.18203/2319-2003.ijbcp20213369>

Original Research Article

## Assessment of knowledge, attitude and practice of insulin injection among subjects with diabetes mellitus

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**Received:** 02 July 2021

**Revised:** 02 August 2021

**Accepted:** 03 August 2021

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### ABSTRACT

**Background:** Diabetes mellitus (DM) is a spectrum of common metabolic disorders whose management mainly lies in treating the patients with oral hypoglycemic drugs and insulin along with the dietary and lifestyle modifications. Insulin is administered most subcutaneously. As the insulin injection sites are relatively painless, patients tend to inject in the same area repeatedly rather than moving to a newer site and increase risk for development of injection site reactions like lipodystrophy and impairment of glycemic control. Hence, it is utmost important for every diabetic patient and their relatives who would inject the insulin injection to be aware of appropriate manner of insulin injection. This helps in maintaining adequate glycemic control in diabetic patients. The main objective of this study was to assess the knowledge, attitude and practice of insulin injection technique among the diabetic patients.

**Methods:** A cross-sectional study was conducted in the department of Endocrinology on 250 diabetic patients taking insulin injections based on inclusion and exclusion criteria. A validated questionnaire was administered to patients to answer in order to assess their knowledge, attitude and practice about technique of insulin injection.

**Results:** In this study, it was found that 90% of the patients were aware of rotating the injection site, whereas only 40% of the patients were aware of appropriate time duration (5-10 sec for syringes/counting 1-15 for releasing the pen) required for resting the syringe/pen needle inside the skin. Only 48% of the patients used to remove the air bubble prior to injection, 57% pinched the injection site before injecting, 20% rubbed the injection site after injection and 30% used to wash hands prior to injection. Hypoglycemia was the most common adverse effect noted in 54% of patients.

**Conclusions:** It can be concluded from the present study that every patient and his/her attendant needs to be educated and trained appropriately regarding technique of injecting insulin injection for betterment of their health.

**Keywords:** Insulin, Knowledge, Attitude, Practice of insulin injection

### INTRODUCTION

Diabetes mellitus (DM) is a spectrum of common metabolic disorders caused due to genetic and environmental factors involving insufficient secretion of insulin, reduced responsiveness to endogenous or exogenous insulin.<sup>1</sup> With the technological advances there has been increase in the number of patients diagnosed with DM and treated with insulin in initial stages.<sup>2</sup> Insulin is the drug of choice in type 1 diabetes and also for treating type

2 diabetes along with other anti-diabetic medications.<sup>1</sup> It is most commonly administered via subcutaneous route.<sup>3</sup>

Insulin therapy can lead to development of adverse drug reactions at injection site like lipohypertrophy/lipoatrophy, bruising and allergic reactions etc., which can further lead to development of poor metabolic control and glycemic variability.<sup>4</sup> Multiple factors play role involving the technique of insulin injection leading to such adverse drug reaction.<sup>2</sup> Hence, patients should be taught to examine their own injection sites and educated regarding

appropriate technique of injection and manner of rotating injection sites for early recognition of any skin changes. They should be motivated to undergo periodic health check-up along with practicing correct injecting techniques for better health care as Insulin once started needs to be taken for lifelong based on glucose levels.<sup>2,4</sup>

There is a need to understand and know the knowledge, attitude and practice of insulin injecting techniques by diabetic patients, so that adequate education could be provided to the patients regarding insulin injection techniques along with awareness of insulin related adverse drug reactions which could improve the healthcare quality of life.

### Objective

Objectives of the study were to assess the knowledge, attitude and practice of insulin injection techniques among the diabetic patients.

### METHODS

A cross-sectional study was conducted among the 250 diabetic patients who visited the department of endocrinology at M. S. Ramaiah medical college and hospital from December 2015 to March 2017 for a period of one year three months. The study was ethically approved by institutional ethics committee prior to commencement. A written informed consent was taken from all the patients who were willing to participate in the study. A series of questions were presented to diabetic patients (either on an outpatient consultation or inpatients) under the department of endocrinology. Post assessing the eligibility criteria, these patients were provided with set of questionnaires designed pertaining to technique of insulin injection. Thereafter, the responses to the questionnaire were assessed along with interpretation of results. Statistical analysis-all the quantitative variables like age, duration of DM, BMI etc., were presented using descriptive statistics like mean, median, range and standard deviation. All the qualitative variables like frequency of insulin injections, gender etc., were presented using frequencies and percentages. The participants and their relatives who

followed incorrect methodology were further counselled about the correct technique of insulin injection.

### Inclusion criteria

Diabetic patients-type 1 or type 2, aged 18 years and above, on insulin therapy and willing to give informed consent were included in the study.

### Exclusion criteria

Pregnant and lactating mothers were excluded from the study.

### RESULTS

In this study, a total number of 250 diabetic patients on insulin therapy were included. Table 1 summarizes age and gender distribution with various other characteristics of diabetic patients in this study, which showed there is slightly male preponderance and majority of patients were adults with a mean age of 55 years. Table 2 summarizes the percentage of various aspects of knowledge attitude practice of insulin administration. Among 86% of patients who stored insulin vial or cartridges in fridge; 84% stored in fridge whereas, the rest 2% in earthen pots. Those who used fridge for storage used appropriately the lower compartment of it and not in the freezer. Rubbing at the injection site after administration of the insulin was done by 20%. Rubbing can cause localized minute hemorrhages or bruises. Three patients with lipodystrophy presented with bruise and mild hemorrhage at the injection site. Approximately 57% of the diabetic patients pinched the site of injection/raise the skin to inject the insulin. Majority of the patients used to inject insulin 15-20 min prior to consumption of food however 2 of them used to take insulin after eating meals. The most commonly used insulin syringes were of 40 cc followed by 100 cc with most common needle size 6-or 8-mm. Insulin pens injected by these patients were mostly 4 mm in size. In this study, diabetic patients on insulin therapy used to change needle of insulin pens and syringes once in 3-4 days and most commonly after injecting 6/more injections (Table 2).

**Table 1: Demographic data of diabetic patients on insulin therapy.**

Variables	Number of patients (%)
<b>Females</b>	108 (43)
<b>Males</b>	142 (57)
<b>Age range (Years)</b>	18-89
<b>Mean age (Years)</b>	55±13.8
<b>History of smoking</b>	65 (26)
<b>History of alcohol intake</b>	70 (28)
<b>Type of diabetes</b>	Type 1-5 patients Type 2-245 patients
<b>Family history of DM</b>	69 (28)
<b>Mean duration of DM (Years)</b>	13±8.33

**Table 2: Knowledge, attitude and practice of insulin injection among subjects.**

Questionnaire pertinent to insulin injection techniques	Percentage (%)
Hypoglycemia	54
Storage of insulin vials/cartridges (fridge/earthen pot)	86
Expiry date not checked	49
Rotation of site of injection	90
Change of insulin pen needles and syringes	Once in 3-4 days or after 6 injections
Removal of air bubble from syringe prior to injection	48
Hand wash prior to injection	30
Rubbing the site after injection	20
Awareness about resting the syringe needle inside skin for 5-10 sec/counting 1-15 number then lifting the pen from skin	40
Pinching the site prior to injection	57
Insulin +oral hypoglycemic agents	66.8
Awareness with respect to types of DM	40
Syringes most commonly used (CC)	40 or 100
Needle length of syringes (mm)	6 or 8
Needle length of insulin pens (mm)	4

## DISCUSSION

It is utmost important for every diabetic patient and their relatives who would inject the insulin injection to be aware of appropriate manner of insulin injection. In this study we tried to understand the knowledge, attitude and practice of insulin injection technique. Correct guidelines need to be followed in order to reduce the incidence of lipodystrophy due to insulin injection. This helps in maintaining adequate glycemic control in diabetic patients. Therefore, it is important to educate diabetic patients and their attenders with respect to appropriate technique of insulin injection. There is male preponderance compared to female in the study and with an average age group of 55 years. In accordance with recent guidelines for insulin injection technique forum for injection technique (FIT) Ireland, 2012 and studies conducted by Mary et al, Samaira et al and Bahar Vardar et al, a series of questions were compiled and validated.<sup>5-8</sup> After the questionnaire was answered, patients and their relatives were counselled about the appropriate technique of insulin injection personally. Those patients who were found to be practicing incorrect technique of administration of injections were re-counselled regarding appropriate technique of injection.

In a similar study conducted by Ramalakshmi et al, in diabetic centre of Lagos state university teaching hospital, the adverse effects of insulin and hypoglycaemic therapy was assessed with the help of questionnaire consisting of nine questions assessing the knowledge of insulin, storage requirements of insulin, site change during insulin therapy, discomfort during therapy, dosage adjustments, dietary modifications, management of hypoglycaemic conditions and complications of diabetes.<sup>9</sup> It was observed that patient's knowledge about their insulin preparation and dosage increased when they were counselled for the same and also the incidence of adverse effects came down significantly with proper counselling of the patients.<sup>10</sup>

Along with insulin injection, 66.8% used to consume oral hypoglycaemic agents and hypoglycaemia was experienced in 54% of these patients (Table 2). Weakness and dizziness were the most common symptoms. In a survey conducted by Shriram et al, among 2530 Americans with type 2 diabetes 55% reported having experienced hypoglycaemia.<sup>11</sup> In another retrospective, an interview-based study by Miller et al, among 1055 type 2 diabetics, the prevalence of hypoglycaemia was 16% in those consuming OHAs and in 30% of those injecting insulin.<sup>12</sup> Glucose (15-20 gm) is the preferred treatment for the conscious individual with hypoglycemia, although any form of carbohydrate that contains glucose may be used. The individual should consume a meal or snack to prevent recurrence of hypoglycaemia.<sup>11</sup> Also, based on the recommendations by American diabetic association (ADA) and forum for injection of insulin (FIT) the results of this study were compared in order to understand how insulin injection needs to be appropriately administered in order to reduce the frequency of insulin induced related adverse effects.<sup>13,14</sup> Limitation of this study is lack of follow up of all patients after counselling for following the appropriate technique as this study was mainly cross-sectional.

## CONCLUSION

The questionnaire which was administered to assess the knowledge, attitude and practice of insulin injection determined that majority of the patients were rotating injection sites and storing insulin vials/cartridges appropriately. However, checking expiry dates of insulin vials/cartridge, frequency of changing needles/syringes, hand washing and pinching the skin etc., still needs to be practiced efficiently. Those patients who were found to be practicing incorrect technique of administration of injections or those who were unaware of appropriate technique were re-counselled with respect to correct

method of insulin administration. The observations of the present study have generated information about prevalence of insulin induced lipodystrophy along with knowledge, attitude, and practice of injection technique. Hence it can be concluded that active surveillance of adverse reaction like insulin induced lipodystrophy should be done as it is preventable, which further could help in avoiding variability in glycemic levels among diabetic patients who are on long term insulin therapy. Diabetic patients and their relatives should be well educated with respect to appropriate technique of insulin.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

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**Cite this article as:** Shravani B, Anuradha HV, Kalra P. Assessment of knowledge, attitude and practice of insulin injection among subjects with diabetes mellitus. *Int J Basic Clin Pharmacol* 2021;10:1130-3.