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Original Article

Assessment of insulin injection techniques among diabetes patients in a tertiary care centre

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ABSTRACT

Aims: The efficacy of insulin therapy in diabetes depends on proper storage and injection technique. The purpose of this study was to assess the practice of insulin administration among diabetes patients in a tertiary care center.

Materials and methods: This observational study was done in Endocrinology department of a tertiary care center during April–June 2015. The consecutive patients using insulin for at least three months by either syringe or pen were recruited. All of them underwent a survey by the questionnaire which focused on key insulin injection parameters.

Results: One hundred and sixty eight (74.67%) patients were storing insulin vials properly. The thigh was the most common site of insulin injection and 209(92.89%) study participants were rotating at the injection sites. Only 48.57% (34/70) subjects were mixing insulin properly before injection. The practice of hand washing and the cleaning of the injection site was practiced by 158(70%) & 171(76.44%) subjects respectively. One hundred and fifty six (69%) patients were injecting with the proper skin fold and 123 (55%) subjects were injecting insulin at 90° angle. The majority of patients (91%) were throwing the needle and syringes directly into the garbage and public drainage system.

Conclusions: There was a significant gap between the insulin administration guidelines and current insulin injection practice. The diabetic education and counseling about proper insulin injection techniques should be provided to all diabetic subjects.

1. Introduction

Diabetes mellitus (DM) is one of the major chronic diseases with its prevalence steadily increasing all over the world. India is the home to 69.2 million people with DM [1]. It is expected that this figure will cross 123.5 million by 2040. Insulin is the essential component of the management of DM. About 3.2 million Indians depend on insulin injections for the management of diabetes [2]. Despite the use of insulin by one third diabetic patients, the mean HbA1c was 8.9 ± 2.1% in DiabCare India 2011 study [3]. Poor injection technique is one of the important and modifiable reasons for inadequate glycemic control [4]. Improving insulin injection technique results in the better glycemic control [5]. The storage conditions of insulin can also affect the potency of insulin [6]. Additionally, the improper disposal of the sharp generated through diabetes management is a major concern as it can be associated with risk of transmitting the blood borne infections [7,8].

Providing the basic information such as the storage, injection site selection, and the correct method of injection could be instrumental in preventing faulty injection technique. The first Indian guidelines for insulin administration were described in 2012 [9] which were updated in 2015 [2] to address these issues. Various studies across the globe have reported the significant gap between the recommendations of the guidelines and actual practice of the insulin use [10–13]. The literature is limited on this aspect from India [14]. Therefore, we conducted this study to assess the practice of storage, administration of insulin and disposal of sharp waste in patients with diabetes.

2. Subjects, material and methods

This observational study was done in Endocrinology department of Jawaharlal Institute of Postgraduate Medical Education

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and Research (JIPMER) during April–June 2015. The consecutive patients using insulin for at least three months by either syringe or pen were recruited. All of them gave written informed consent. The study was in compliance with the Declaration of Helsinki and was approved by the Institute Ethics Committee. All patients underwent a survey by the questionnaire which focused on key insulin injection parameters (Table 1). The questions were developed on the basis of the recommendations of the Forum of Injection Technique, India [2]. All questionnaires were checked for quality and completeness of information. The patients complaining the local site complications were examined by the investigators.

The insulin injection parameters were as follows: (1) Current insulin injection practice: type of insulin, storage of insulin at home and while traveling, injection device and needle length, the number of injections per day, the choice of injection site, site rotation, time gap between insulin and food ingestion, method of mixing insulin prior to use, the practice of hand washing, disinfection of injection site, the use of skin folds, needle entry angle, the time the needle remains under the skin,& needle disposal practice. (2) Complications at injection sites: pain, bruising, and swelling suggestive of lipohypertrophy (LH). (3) Patients' perception of fear and their unwillingness regarding insulin injection.

Statistical analysis was performed using Graphpad Prism 6. Kolmogorov-Smirnov test was used to verify the sample distribution. The continuous variables with normal distribution and without a normal distribution were expressed as mean ± standard deviation and median (interquartile range) respectively. The categorical variables were presented as the percentage (number) and Chi-square test was used to assess the differences between two groups.

3. Results

Two hundred and twenty five patients completed the study. The mean age of the subjects was 50 years. One hundred and thirty three (59.11%) study participants were male. One hundred and fifty seven (69.78%) patients were from the rural area. There were 195 (86.67%) patients with type 2 DM, and 30(13.33%) patients with type 1 DM. The median duration of diabetes was six years. The median duration of insulin use in type 1 and type 2 DM were five and three years respectively. The premixed insulin was the most common type of insulin used in this study. One hundred and sixty eight (74.67%) patients were storing insulin vials at proper temperature either in refrigerator or earthen pot. Forty four (19.5%) subjects were keeping the insulin vials at room temperature, and 13(5.77%) in a deep freezer. Two hundred and twenty one (98.22%) patients were transporting insulin without maintaining cold chain during travel.

The majority of the patients (216/225) were using needle and syringe for administration of insulin. The proportion of subjects used various needles were: 52(23.11%) subjects used 12.7 mm needles, 42(18.66%) used 8 mm needles, 55(24.44%) used 6 mm needles, and 4(1.79%) used 5 mm needles. Seventy two (32%) patients were unaware of the needle length used. The average number of insulin injections taken was 2.50/day. The number of subjects using various insulin injection sites were: thigh 160 (71.55%), arm 120(53.33%), abdomen 58(26.22%), buttock 9(4%) and leg 7(3.55%) (Figs. 1 and 2). Two hundred and nine (92.89%) study participants were rotating at injection sites. The patients were injecting insulin within 5 min of bringing out vials from the refrigerator. The median time gap between injection and meal was 10 min.

Seventy patients were mixing the insulin before use but only 34 were following correct order of withdrawal of insulins from vials. The practice of hand washing was followed by 158(70%) patients. The cleaning of the injection site before insulin administration was practiced by 171(76.44%) subjects. One hundred and fifty six (69%) patients were injecting with the proper skin fold and 123(55%) subjects were injecting insulin at 90° angle. Needle reuse was a common practice, and 218(96.89%) patients were using the needle for more than once. Each needle was reused for average six times. Only 22(10%) subjects were waiting for 5–10 s before the withdrawal of the injected insulin needle. The majority of the patients (205/225) were throwing the needle and syringes directly into the garbage and public drainage system. The other ways of the

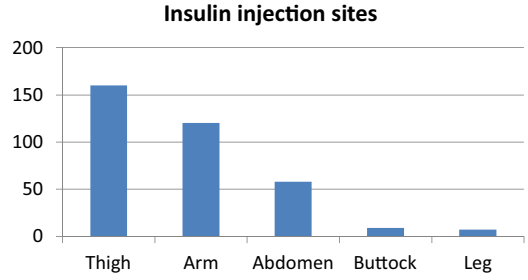

Fig. 1. The chart showing number of patients using various injection sites.

Table 1
Questionnaire for insulin injection technique survey.

1. Where are you storing insulin?
2. How are you transporting insulin?
3. Which insulin are you using?
4. Which device are you using to give injection?
5. What is the length of the needle?
6. How many times are you using one needle?
7. Are you washing hands prior to insulin injection?
8. Are you cleaning the site before injection?
9. How much time are you keeping insulin at room temperature before injection?
10. What is the time gap between injection and meal?
11. Where are you injecting insulin?
12. Are you changing insulin injection sites?
13. Are you making skin fold?
14. How are you putting needle to the injection sites?
15. Are you mixing insulins prior to the injection?
16. How are you mixing insulins?
17. How much time are you keeping needle inside after injecting?
18. Do you have pain, bleeding or swelling at the site of injection?
19. Where are you throwing needles?
20. What do you feel about insulin injection?

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