



REAL-WORLD SURVEY ON INSULIN INJECTION TECHNIQUES AMONG PEOPLE WITH DIABETES IN SEMI-URBAN AND VILLAGE POPULATION IN KERALA

Medicine

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ABSTRACT

Introduction Glycemic control remains sub-optimal amongst people with diabetes in India. Insulin therapy helps people to reach their glycemic goals. The success of insulin therapy in diabetes depends on proper storage and correct injection technique. The aim of this study is to assess the current insulin injection technique among people with diabetes in the semi-urban and village population in Kerala. **Materials And Methods** This observational study was conducted from June to December 2021 in Tirur and Pathanamthitta, Kerala. A total of 140 participants from 25 to 60 years, using insulin for at least three months by either syringe or pen were recruited. Informed consent was obtained and a survey questionnaire that focused on key insulin injection practices was administered. **Results** The most common site of insulin injection was the abdomen 80 (57.14%). Injection site rotation was followed by 132 (94.28%) The practice of handwashing and cleaning the injection site was practiced by 110 (78.57%) & 105 (75%) respectively. About 135 (96.42%) subjects were using the needle more than once. 110 (78.57%) were storing insulins at the proper temperature. 75 (53.57%) reported having pain at the injection site and 25 (17.85%) had noticed swelling at their injection sites. The majority of patients 135 (96.42%) were throwing the needle and syringes directly into the garbage and public drainage system. **Conclusion** Our study identified a significant gap between the insulin administration guidelines and current insulin injection practice. Healthcare professionals need to revisit the importance of injection techniques in refresher sessions for insulin users and caregivers, regular reinforcement ensures that the information is remembered and acted upon.

KEYWORDS

Insulin Injection technique, Insulin storage, Insulin disposal

INTRODUCTION

The International Diabetes Federation (IDF) 2019 Atlas estimates that India has a burden of 77 million adults with diabetes and projected to increase by 74% in 2045.¹ 1 in 6 adults with diabetes in the world comes from India. The prevalence of diabetes has increased significantly in India in the last few decades, and it reached 8.9% in 2019 IDF estimation.¹ There are multiple factors such as incorrect choice of the injection site, faulty delivery devices, and improper techniques that may modify insulin absorption parameters. Clinical experience as well as evidence indicates that poor injection technique is one of the important and modifiable reasons for inadequate glycemic control. Improving insulin injection technique at the patient and caregiver level results in better glycemic control.² Improper disposal of the needles is a major concern as it can increase the risk of transmitting blood-borne infections.³

Basic information such as storage, injection site selection, and the correct method of injection is to be explained to the patients and caregivers. The Indian Recommendations for Best Practice in Insulin Injection Technique was published in 2017.⁴ This study was conducted to assess the practice of storage, administration of insulin, and disposal of sharp waste in people with diabetes in semi-urban and village populations in Kerala.

MATERIALS AND METHODS.

This cross-sectional study was conducted in two diabetes specialty care centers in Tirur, Pathanamthitta, Kerala from June to December 2021. A total of 140 people with diabetes from 25 to 60 years, who were using insulin for at least three months were recruited. Informed consent was obtained from all the participants. All patients underwent a questionnaire survey that focused on key insulin injection parameters. The questions were based on the recommendations of the Forum of Injection Technique, India.

The insulin injection parameters were: 1. Current insulin injection practice: type of insulin, storage of insulin, injection device, the choice of injection site, site rotation, the time the needle remains under the skin, the practice of hand washing, disinfection of injection site, needle disposal practice. 2. Complications at injection sites: pain, bruising, and swelling suggestive of lipohypertrophy (LH).

RESULTS:

One hundred and forty participants completed the study. The mean age of the participants was 49.22 ± 12.31 . Ninety (64.28%) study participants were male. There were 131 (93.57%) patients with type 2 DM, and 9 (6.42%) patients with type 1 DM. The median duration of diabetes was 7.52 ± 8.13 . The median duration of insulin use 4.3 years.

[Table 1] Premixed insulin was the most common type of insulin used in this study 105 (75%) compared to basal insulins 35 (25%).

Table 1 Baseline Characteristics

Baseline characteristics	Participants
Age (mean $\pm$ SD)	49.22 $\pm$ 12.31
Sex	
Male n (%)	90 (64.28)
Female n (%)	50 (35.71)
Type of Diabetes	
T2DM n (%)	131 (93.57)
T1DM n (%)	9 (6.42)
Duration of Diabetes (mean $\pm$ SD)	7.52 $\pm$ 8.13
Insulin Use (mean $\pm$ SD)	4.3 $\pm$ 1.12

On insulin storage questions around 110 (78.57%) patients were storing insulin at a proper temperature either in the refrigerator or earthen pot. Around 18 (12.85%) subjects were keeping the insulin at room temperature, and 12 (8.57%) were in a deep freezer. One hundred and twenty-eight (91.42%) patients were transporting insulin without maintaining a cold chain during travel.

The number of subjects using various insulin injection sites was abdomen 80 (57.14%), thigh 45 (32.14%), arm 12 (8.57%), and buttock 3 (2.14%) Table 2. Around 132 (94.28%) study participants were rotating injection sites as recommended by their physicians.

Table 2: Insulin injection site

Injection site	Number of subjects
Abdomen	80 (57.14)
Thigh	45 (32.14)
Arm	12 (8.57)
Buttock	3 (2.14)

The practice of hand washing was followed by 110 (78.57%) patients. The cleaning of the injection site before insulin administration was practiced by & 105 (75%) subjects. Needle reuse was a common practice, and 135 (96.42%) patients were using the needle more than once. Each needle was reused on average 6.5 times.

Seventy-five (53.57%) subjects reported having pain at the injection site, and 45 (32.14%) subjects reported bleeding and or bruising at the injection site. Twenty-five (17.85%) subjects had noticed persistent swelling at their injection sites suggestive of LH. (Table 3) The majority of the patients 135 (96.42%) were throwing the needle and syringes directly into the garbage and public drainage system.

Table 3: Injection Site Complications

Parameter	Number of Subjects
Painful Injections	75 (53.57)
Bleeding and/or bruising	45 (32.14)
Lipohypertrophy	25 (17.85)

DISCUSSION

In people with diabetes using insulin, poor injection technique can lead to poor absorption of injected agents. This in turn may cause problems, like hypoglycemia, or delayed absorption, which can result in periods of hyperglycemia. A correct subcutaneous injection technique may be defined as one that reliably delivers medication into the subcutaneous space without leakage and with minimal discomfort.

To achieve this, the correct technique is crucial, our study represents the practice of insulin injection techniques among people with diabetes in South India. There are multiple national and international studies conducted earlier on insulin injection techniques, the comparison of the findings from our study with results gathered from international and national surveys is shown in [Table 4].

Table 4: Injection technique surveys comparison between various studies

Parameters	Strauss et al.5	De Coninck et al.6	Ji et al.7	Patil M et al.8	Kalra S et al.9	Choudhary A et al.10	Our study
No of patients	1002	4352	380	225	1008	150	140
Average Age of patients (years)	47	48.4	54.56	50	51.1	48.32	49.22
Duration of insulin therapy (years)	14.7	13.9	3.62	3	5.5	3.5	4.3
Insulin Injection sites (%) Abdomen	85	88	92.89	26.22	51.4	53.33	57.14
Thigh	69	59	24.21	71.55	32.5	36.66	32.14
Arm	34	29	22.89	53.33	14.1	8.66	8.57
Buttock	24	16	5	4	1.7	1.33	2.14
No of patients practicing rotation of injection sites (%)	38	91	92.11	92.89	-	95.33	94.28
Prevalence of lipohypertrophy (%)	29	48	15.79	11.11	-	14.66	17.85
Average no of times single needle used	3.33	3.6	9.19	6	4	8	6.5
No of patients disposed needles directly into garbage (%)	47	38	13.42	91	60.9	97.33	96.42

Although manufacturers recommend storing insulin in the refrigerator, injecting cold insulin can sometimes make the injection more painful. To avoid this, many providers suggest storing the bottle of insulin in use at room temperature. Insulin kept at room temperature will last approximately one month.¹¹ It recommends storing the insulin in a refrigerator or earthen pot filled with water and must be kept at room temperature for 30 min prior to injection after taking it out from the refrigerator. The vials in use can be stored at room temperature for 30 days. Some useful tips for storing insulins are summarized in Table 4.

Table 4: Useful tips for insulin storage

Tips for storing insulin
- Do not store your insulin near extreme heat or extreme cold. - Never store insulin in the freezer, direct sunlight, or in the glove compartment of a car. - Check the expiration date before using, and don't use any insulin beyond its expiration date - Examine the bottle closely to make sure the insulin looks normal before you draw the insulin into the syringe

In our study 110 (78.57%) patients were storing insulin vials at proper temperature either in refrigerator or earthen pot. The most common injection site in our study was abdomen which was similar across other national and international surveys but Patil M et al reported thigh to be most used injection site. Rotation of injection sites was practiced by majority of our patients at a rate comparable with the most recent international surveys (Table 3).

Reusing syringes and needles may help cut costs for the patients but, this decision to be discussed between the treating physician and the patient before beginning reusing. If the patient is ill, have open wounds on hands, or have poor resistance to infection, the insulin syringe reuse to be avoided.¹¹ Some tips to keep in mind when reusing syringes are summarized in [Table 5]. In our study Needle reuse was a common practice, and 135 (96.42%) patients were using the needle more than once. Each needle was reused on average 6.5 times.

Table 5: Tips for reusing syringes and needles.

Tips for reusing Syringe and needles
- Keep the needle clean by keeping it capped when not using it. - Never let the needle touch anything but clean skin and the top of the insulin bottle. - Never let anyone use a syringe you've already used, and don't use anyone else's syringe. - Cleaning it with alcohol removes the coating that helps the needle slide into the skin easily.

Evidence suggests that correct technique is imperative if people with diabetes are to benefit from medical advances, as much credence therefore needs to be given to injection technique as to the agent being injected.

CONCLUSION

Despite considerable advances in technologies and therapies over the past decade, the way people inject has not improved and worrying trends and practices continue. Our study identified a significant gap between the insulin administration guidelines and current insulin injection practice. Healthcare professionals need to revisit the importance of injection technique in refresher sessions for insulin users; regular reinforcement ensures that the information is remembered and acted upon.

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