

A Study to assess the ongoing insulin injection practices among patients with diabetes mellitus and health care professionals and re-education of insulin injection techniques for improvement in glycaemic control.

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ABSTRACT

Background

Diabetes affects a large portion of the population in India; 101 million individuals, or 11.4% of the total population, are believed to have the disease. Regardless of the length of their illness or the type of treatment they are receiving, diabetic individuals on insulin therapy frequently still exhibit inadequate glycaemic control. In order to achieve glycaemic control and hence avoid complications from diabetes, proficient injection technique is essential.

Material and methods

The work on the First Indian Insulin Injection Technique Guidelines developed by the Forum for Injection Technique (FIT) A questionnaire was used to assess the ease of understanding, relevance, items, potential required questions, and feelings about diabetes treatment and ongoing practices.

Results

In our study, only 9% of patients were fully aware of injection technique, while 22% were partially aware, and a significantly higher 69% were unaware, showing significant lacunae in patient education, understanding, and adherence, as well as shortcomings from healthcare professionals.

Conclusion

The majority of patients required periodic review using a straightforward and patient-friendly questionnaire, as well as re-education for both patients and carers, due to major shortcomings in awareness, technique, and adherence to insulin injection strategies.

Keywords: Diabetes mellitus, Glycaemic control, Injection techniques

Introduction

The prevalence of diabetes is increasing at an alarming rate. India shares a significant burden of diabetics, from 74.9 million in 2021 to 124.9 million by 2045 [1]. It's estimated that 101 million people in India—11.4% of the country's population—live with diabetes [2]. Diabetic patients on insulin therapy often continue to show suboptimal glycaemic control, irrespective of the duration of the disease or treatment. A clinical audit of adult patients with T2DM has demonstrated that more than 65% of patients had poor control, despite adherence to oral and injectable treatment. Poor glycemic control stems from many sources, including poor self-efficacy regarding insulin dosage adjustment, inaccurate insulin dosing, expired insulin, lipohypertrophy of the injection sites and technique, and equipment issues. Advances in the treatment of diabetes have led to an increase in the number of injectable therapies, such as human insulin and insulin analogues.

Uncontrolled glycaemic levels may be attributed to external factors, but not to the most straightforward issue, which could be an incorrect injection technique. Improper technique includes the use of inappropriate needle length, failure to rotate the injection site, and the reuse of needles—all factors that can directly affect medication being absorbed in an unpredictable manner. Lipohypertrophy, the accumulation of fatty tissue caused by poor site rotation; repeatedly injecting into the same area, is often overlooked, and it affects about half of the people using injectable therapy, resulting in variable absorption and erratic glycaemic control. This study is aimed at assessing and re-educating patients and carers on best practices for insulin injection administration, including selecting the optimal type of needle or syringe, the proper use of a lifted skin fold where necessary for injection site rotation, storage and expiration of insulin, single use of needles, and finally compliance and adherence to the advised technique [3].

Aims & objectives

- 1) To assess ongoing insulin injection practices among patients of diabetes.
- 2) To re-educate patients about insulin injection technique.
- 3) To re-educate family members and care givers for proper insulin injection techniques.
- 4) To assess the impact of re-education on glycaemic control.

Materials & methods

The study was done at L.N. Medical College and J.K. Hospital, Bhopal, in the Department of Medicine for a period of six months from June 1 to December 31, 2023. A total of 100 diabetic patients on injectable insulin therapy were enrolled in the study.

Patients were asked to complete a short survey questionnaire to evaluate their baseline awareness and knowledge of insulin techniques. Then, correct answers were given, and a short 10- to 15-minute' re-education instruction session was explained and demonstrated with written materials [4].

Having a good injection technique means that the correct dose of medication is delivered to the correct injection site to achieve the best possible glycaemic outcomes [5].

Results

Demographic characteristics of patients are shown in table number one and diabetes with treatment variables in table number two while questionnaire in table number three.

Table No:1: Demographic characteristics of Patients with Diabetes Mellitus

Age	< 50 years	>50 years	Total
	44	56	100
Gender	Male	Female	Total
	65	35	100
Residence	Urban	Rural	Total
	73	27	100
Socioeconomic status	High income class	Middle income class	Low income Class
	15	55	30
Education Level	Illiterate & Primary	Graduate	Higher
	33	40	27

Table No: 2: Diabetes and treatment variables

Type of diabetes	Type 1	Type 2	Total
Number of patients	22	78	100
Duration of diabetes	<5 years	5-10 years	>10 years
Number of patients	22	41	37
Degree of hyperglycemia by Hb1Ac	Well control <7 %	Inadequate control 7-8.5%	Poor control >8.5%
Number of patients	8	21	71
Duration of injectable insulin injection therapy treatment	<1 year	1-5 years	>5 years
Number of patients	27	39	34
Type of insulin therapy	Basal +/- OHA Regimen	Basal + Bolus Regimen	Premixed insulins
Number of patients	18	27	55

The following Questionnaire of twelve simple questions was used to assess the patients and care givers practices of insulin injection technique.

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	Questions	Response from patients	Yes	No	May be / doesn't recall
1	How long you are on injectable therapy?				Months / years
2	Do you always prime your pen/syringe before injecting insulin \by giving an air shot?		Yes	No	Sometimes
3	Do you replace the needle of pen or syringe before injecting insulin ?		Yes	No	Sometimes
4	Do you check your insulin injection site for cleanliness before injecting insulin?		Yes	No	Sometimes
5	Do you hold the needle in your skin for 5 to 10 seconds after pressing the button?		Yes	No	Sometimes
6	Do you look for any lesion or lumps over your skin near injection sites ?		Yes	No	Sometimes
7	Do you rotate your injection sites with each dose of insulin injection ?		Yes	No	Sometimes
8	What is the length of needles you use regularly for injecting insulin ?	4mm or 5mm	6mm or 8mm	12mm or more	Know/ Don't know
9	Are you aware of various insulin injection sites?	Tummy/ lower abdomen	Legs/ thighs/ hips	Upper buttocks	Know/Don't
10	Are you aware of various needle insertion techniques ?	Injection straight down	Injection at an angle	Use of pinch up technique	Know/Don't
11	Have you always discussed your insulin injection issues with your healthcare professionals ?	Response	Yes	No	Sometimes

12	Have your doctor explained you insulin injection techniques and reassess them regularly?	Response	Yes	No	Sometimes / Doesn't recall
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A total of 100 patients were enrolled in the study, of which 65% were male and the rest, 35%, were female. Males were in higher numbers for unclear reasons, such as earlier acceptance of injectable insulin therapy, probably earlier access to medical facilities, or earlier complications due to multiple risk factors that need further study.

There is a higher number of patients in urban and suburban areas (73%), as compared to rural areas, which had only 27% of patients. It can be attributed to early recognition, better medical facilities in urban areas, and increased screening for diabetes. There were 44% of patients under the age of 50, with a slightly higher 56% over 50 years. There were a significant number of patients from middle-income (55%), low-income groups (30%), and lower 15% among the higher-income groups.

In our study, patients with a graduation level of 40% or higher (27%) showed a higher number and acceptance of injectable therapies than primary or illiterate patients. In our study, we found that in patients with type 2 diabetes, 78% were much higher than in those with type 1, which is only 22%, which can be attributed to the higher prevalence of type 2 diabetes in the Indian subcontinent. Duration of diabetes of 5 to 10 years had a significant number of patients (41%), followed by a more 10-year duration of 37%, and only 22% for a 5-year duration.

A significantly higher number of patients (71%) had poor glycaemic control with HbA1c of 8.5 and higher, while only 8% had well-controlled HbA1c <7 and 21% had inadequate control HbA1c 7-8.5. In our study, premixed or mixtard insulin was prescribed and used by a higher number of patients (55%), which can be attributed to economic reasons: just two doses and better acceptance than basal bolus regimen (27%), and basal with oral antidiabetic therapy (18%) only.

In our study, only 9% of patients were fully aware of injection technique, while 22% were partially aware (20% male and 11% female), and a significantly higher 69% were unaware, of which 45% were male and 24% were female, showing significant lacunae in patient education, understanding, and adherence, as well as shortcomings from healthcare professionals.

Discussion

The prevalence of diabetes is increasing, and more and more people require injectable therapy due to inadequate responses to oral hyperglycemic drugs for type 2 diabetes and insulin therapy for type 1 diabetes. Injection technique is an important factor in determining the efficacy of insulin and other injectable therapies in diabetes (6–10). The results of our study showed that insulin injection practices were variable among patients and carers and showed improper technique and a lack of proper awareness and education.

Only 9% of patients were fully aware of injection technique, while 22% were partially aware (20% male and 11% female), and a significantly higher 69% were unaware, of which 45%

were male and 24% were female, showing significant lacunae in patient education, understanding, and adherence, as well as shortcomings from healthcare professionals.

The most important finding of concern was that the large numbers of participants were not priming their injection device before injecting (78%), reusing their needles (84%), only 12% cleaned sites before injection, 36% injecting into lumps or bumps, and only 27% rotated sites of injection.

Katherine d et al. [4] conducted a study that is consistent with our findings that 18% were not priming their injection devices before injection, 54% were reusing their needles, and 20% were injecting into bumps, lumps, or pits under their skin.

The study conducted by Milind Patil et al. [5] showed that the thigh was the most common site of insulin injection, and 92.89% of study participants were rotating at the injection sites. Only 48.57% of subjects were mixing insulin properly before injection. The practice of hand washing and the cleaning of the injection site were practiced by 70% and 76.44% of subjects, respectively. And 69% of patients were injecting with the proper skin fold, and 55% of subjects were injecting insulin at a 90° angle. Grassi et al. [7] conducted a survey of 346 people with diabetes from Italy who had been on insulin therapy for more than 4 years. The results showed poor knowledge and technique, with the authors noting that most physician visits involve discussion, but very little time is spent looking at ways to improve injection technique.

Data from the U.K. National Diabetes Audit (11) show consistently poor glycaemic outcomes, with only 30% of people with type 1 diabetes and 67% of those with type 2 diabetes achieving target A1C. Widespread poor injection technique is likely to play a role as a contributing factor in this suboptimal glycaemic control.

Since it's the duty of physicians and health care workers to educate and teach their patients the correct injection technique at the initiation of injectable therapy and the importance of both adherence and compliance with therapy, This requires knowledge and skills in the best practice injection technique themselves. Our study demonstrates that patients with diabetes are not aware of proper insulin injection techniques and need re-education and periodic assessment of adherence to injection techniques. We, as health care professionals, need to share our skills with patients and carers for better outcomes in diabetes, reducing complications, and overall patient care.

In a similar study done in Nepal by Poudel RS et al., the insulin injection technique of patients and their relatives was inadequate. The majority of patients and their relatives (58.1%) mentioned that they transport their insulin cartridges without maintaining a cold chain. Thirteen patients, or 30.2%, reported complications from insulin injection, and the most common complication among those patients was bruising (76.9%). Almost all patients disposed of the used needle improperly, and the common method was disposing of the needle in a dustbin and then transferring it to a municipal waste disposal vehicle. Insulin was accepted by just 37.2% of patients.

A study done in Saudi Arabia by Alhazmi GA et al. [12] showed similar results, with four hundred and thirty-seven DM patients participating in the study. The most prevalent age group was between 20 and 60 years old (69.1%). The vast majority of patients were female

(64.1%), Saudi nationals (92.9%), and residents of Makkah City (70%). There were roughly equal numbers of patients with type-1 and type-2 DM (47% and 53%, respectively). With regard to complications of DM, 19.5% of patients had previous acidosis, and 16.5% of patients were admitted to the hospital for various complications. Injection-related complications were reported by almost half of the patients (49.9%). The knowledge of insulin injection practices was examined among DM patients according to different variables. Only the frequency of administration exhibited a significant difference in the practices towards proper insulin injection technique. Patients who administered insulin injection three times daily had the best practices towards insulin injection when compared to other patients.

Conclusion

Patients who self-administer insulin and other injectables lack awareness and understanding, and healthcare professionals also have certain gaps in their knowledge. For this reason, education sessions are essential for evaluating patients' knowledge and methods for improving their glycaemic management.

There is a knowledge gap that has to be filled on the administration of injectables, such as insulin. Many individuals had their initial diagnosis many years ago and were only taught the correct treatments then. They have either forgotten how to administer the medication correctly or established bad habits that prevent it from being administered and absorbed. Periodically reevaluating essential components of pharmaceutical delivery is necessary, particularly if A1C targets are not being reached. Glycaemic levels have a good probability of improving with regular education on injection procedures and ongoing lifestyle and eating habit reevaluations.

We discovered in our research that a questionnaire is a valid tool for evaluating patients with diabetes. With just nine topics, the questionnaire is accurate and manageable to finish in a few minutes. The clinically relevant, acceptable, and user-friendly questionnaire serves as a valuable clinical resource and self-assessment tool for individuals undergoing injectable therapy for diabetes mellitus. It is also educational and enlightening.

Conflict of interest

There were no conflicts of interest.

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