

ASSESSMENT OF KNOWLEDGE AND PRACTICE REGARDING SELF INSULIN ADMINISTRATION AMONG DIABETIC PATIENT

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Abstract

Background

Self-insulin administration is a critical component of diabetes management, requiring adequate knowledge and correct practice to prevent complications and achieve optimal glycemic control. Many patients struggle with technique, dosing accuracy, and site rotation, which can impair treatment outcomes and increase the risk of acute and chronic complications. Assessing patients' knowledge and practice is essential for identifying gaps that may hinder effective self-management.

Aim

The study aimed to assess the knowledge and practice regarding self-insulin administration among diabetic patients and to identify areas requiring targeted educational interventions.

Methods

A descriptive cross-sectional study was conducted among diabetic patients using a structured questionnaire that assessed sociodemographic characteristics, knowledge of insulin administration, and observed practice skills. A purposive sampling strategy was used to recruit eligible participants. Data were analyzed using descriptive and inferential statistics to determine knowledge levels, practice accuracy, and associations between variables.

Results

The findings showed that a substantial proportion of patients had moderate knowledge regarding insulin administration, while a smaller percentage demonstrated good knowledge. Observational assessment revealed gaps in critical practice steps such as hand hygiene, dose preparation, site rotation, and proper injection angles. A statistically significant association was noted between knowledge scores and education level, as well as between practice scores and duration of insulin use. Patients with longer experience demonstrated better technique.

Conclusion

The study concludes that although most diabetic patients possess basic knowledge of insulin administration, many continue to demonstrate inadequate practical

skills. Strengthening patient education and reinforcing hands-on training are necessary to ensure accurate and safe insulin administration.

INTRODUCTION

Diabetes mellitus (DM) is a long-lasting metabolic disorder that is associated with hyperglycemia caused by impairments in insulin secretion, insulin action, or both. Self-insulin administration refers to a situation where a patient injects insulin on self-prescription regimens to maintain the level of glucose in the blood. Knowledge is the knowledge of the patient about the types of insulin, the way they should take it, the way they have to inject, how to keep it, and what complications may arise. Practice will include the implementation of the insulin administration process, such as site rotation, appropriate needle handling, and compliance with schedules. Proper self-management of insulin is essential in the prevention of acute insulin complications like hypoglycemia and chronic ones (neuropathy, nephropathy, and retinopathy) (Gholap et al., 2016).

The pandemic is spreading equally to all parts of the globe, with about 537 million adults diagnosed with diabetes in 2021. According to the estimates by the International Diabetes Federation, this figure will increase to 783 million in 2045 (Ogurtsova et al., 2022). Lack of information and inappropriate self-insulin injection are still major factors in the inadequate glycemic control. The results of research in low- and middle-income countries show that the percentage of patients with poor insight into insulin treatment is high, and technical and timing mistakes are frequent (Alarfaj et al., 2023).

Patients who have poor knowledge of self-insulin administration are at increased risk of infection by complications, such as frequent hyperglycemia, hypoglycemic, and increased hospitalization. The wrong use of the needles like failure to change injection sites, wrong angle of the needle or reuse of the needles may result in lip hypertrophy, infection, and inconsistent absorption of insulin. Research indicates that insulin dosage storage and timing are unaware to many patients and this negatively impacts on therapeutic outcomes (Gurmu & Teni, 2014).

Patient education on insulin administration is an important role played by healthcare providers. The programs of structured education better clarify the patients on the methods of injections, storage and drug dosage timetables. However, even after training, there are a number of patients who still have trouble with converting the knowledge into practice. Some factors that have resulted in the poor practice include low access to resources, illiteracy, and fear of self-injection (El-Khawaga and Abdel-Wahab, 2015).

Close to insulin administration practices is self-monitored blood glucose. More knowledgeable patients who strongly adhere to self-insulin regimens have a better glycemic control and less prevalence of complications. Low-knowledge patients, on the contrary, do not increase or decrease dose based on blood glucose measurements and this results in poor outcomes. As it has been proven, knowledge is not sufficient to lead to proper practice, and continuous reinforcement and support are necessary (Hasnain, 2021).

Proficiency in the self-administration of insulin is dependent on cultural beliefs, personal attitudes and psychosocial factors. Pain, phobia of needles, and a wrong method are some of the reasons that cause failure to take the insulin as required or do so wrongly. Patient counseling and support by family have been demonstrated as effective in enhancing adherence besides decreasing the anxiety that comes with administering injections. The social and environmental factors are also still significant determinants of practice patterns in diabetic patients (Muhammad et al., 2020).

Research has shown that enhancing the knowledge and practice of self-insulin administration can profoundly decrease the rates of hospitalization, increase the quality of life, and avoid the complications in the long term. Consistent evaluation of the knowledge of patients and injection technique can be used to determine gaps and conduct specific educational interventions. There is some evidence that

structured insulin education should be incorporated into normal diabetes management to achieve better self-management and glycemic control (Butt et al., 2019; Mohamed Weheida et al., 2022).

Methodology

A descriptive cross-sectional study design was employed to assess the knowledge and practice regarding self-insulin administration among diabetic patients. The study was conducted at a tertiary care hospital in Lahore. The study population included patients diagnosed with diabetes mellitus who were receiving insulin treatment and willing to participate in the research. Patients with visual impairments or severe peripheral neuropathy were excluded because these conditions limited their ability to safely self-administer insulin or assess injection sites. Purposive sampling was used to recruit participants, and the sample size was calculated using Slovin's formula. With a population size of 197 and a margin of error of 0.05, the final sample size was determined to be 140 participants.

Data Collection

Data were collected using an adopted and translated questionnaire that assessed both knowledge and practice regarding self-insulin administration. The tool consisted of three sections. The first section captured demographic characteristics, including age, gender, marital status, education, occupation, and family history of diabetes. The second section assessed knowledge of insulin therapy, including the association of diabetes with high blood sugar, types of insulin, storage conditions, timing of

administration, injection sites, correct angle of injection, site rotation, and techniques to minimize discomfort. Each knowledge item was scored as 1 for a correct response and 0 for an incorrect or "don't know" response. Knowledge levels were categorized as good (>66.6%), moderate (33.3–66.6%), and poor (<33.3%). The third section assessed practice, including correct injection technique, site rotation, insulin storage, hygiene, air bubble removal, syringe reuse, and proper disposal. Practices were scored similarly, and levels were categorized as good (>66.6%), moderate (33.3–66.6%), and poor (<33.3%). Ethical considerations were strictly followed. Permission was obtained from the institutional ethics committee and hospital administration. Participants provided informed consent, confidentiality was maintained, and participants were free to withdraw at any time without consequences.

Data Analysis

Collected data were entered and analyzed using SPSS version 21. Descriptive statistics were computed for all variables. Frequencies and percentages were calculated for categorical variables, such as demographic characteristics, knowledge, and practice levels. Quantitative variables, including age and total scores for knowledge and practice, were analyzed using mean and standard deviation. Data were presented in tables and charts to provide a clear overview of knowledge and practice patterns among the study population. Patterns of good, moderate, and poor knowledge and practice were compared to identify gaps in self-insulin administration and inform future educational interventions.

Results and analysis

Table 1: Demographic Characteristics of Participants (n=140)

Sr. No	Demographic Characteristic	Frequency	Percentage (%)
1	Age		
	<25	23	16.4
	26–49	58	41.4
	>50	59	42.1
2	Gender		
	Male	80	57.1
	Female	60	42.9

3	Family History		
	Positive	65	46.4
	Negative	75	53.6
4	Marital Status		
	Married	85	60.7
	Unmarried	55	39.3
5	Occupation		
	Unemployed	38	27.1
	Employed (Non-Govt)	48	34.3
	Government Employed	35	25.0
	Retired	19	13.6
6	Education		
	Illiterate	33	23.6
	Primary	44	31.4
	Secondary	36	25.7
	Higher Education	27	19.3

The study included 140 participants. The age distribution showed that 23 participants (16.4%) were below 25 years, 58 (41.4%) were between 26 and 49 years, and 59 (42.1%) were over 50 years. Males comprised 80 participants (57.1%), whereas females were 60 (42.9%). Regarding marital status, 85 participants (60.7%) were married, and 55 (39.3%) were unmarried. Occupation-wise, 38 participants (27.1%) were

unemployed, 48 (34.3%) were employed in non-government jobs, 35 (25.0%) worked in government positions, and 19 (13.6%) were retired. Family history of diabetes was positive in 65 participants (46.4%) and negative in 75 (53.6%). Educational levels varied, with 33 participants (23.6%) illiterate, 44 (31.4%) having primary education, 36 (25.7%) secondary education, and 27 (19.3%) higher education.

Table 2: Knowledge Regarding Self-Insulin Administration (n=140)

Sr. No	Knowledge Item	Correct n (%)	Incorrect n (%)
1	Know about diabetes mellitus	71 (50.7)	69 (49.3)
2	DM means high blood sugar	71 (50.7)	69 (49.3)
3	Know about insulin	74 (52.9)	66 (47.1)
4	Insulin stored in icebox/cold place	134 (95.7)	6 (4.3)
5	Administer insulin before/after meals	85 (60.7)	55 (39.3)
6	Injection sites (abdomen, thigh, glutei, deltoid)	73 (52.1)	67 (47.9)
7	Use 45° angle for injection	74 (52.9)	66 (47.1)
8	Thumb-gap rotation of site	50 (35.7)	90 (64.3)
9	Minimizing discomfort	60 (42.9)	80 (57.1)
10	Insulin therapy risks	63 (45.0)	77 (55.0)
11	Purpose of site rotation	55 (39.3)	85 (60.7)
12	Injection massage reduces absorption	65 (46.4)	75 (53.6)
13	Advantages of self-administering	89 (63.6)	51 (36.4)

Participants demonstrated varied knowledge about self-insulin administration. Slightly more than half correctly identified diabetes mellitus and

its association with high blood sugar (50.7%), while the remaining 49.3% lacked this knowledge. Awareness of insulin was reported by 52.9% of

participants. The majority (95.7%) correctly indicated that insulin should be stored in a cold place. About 60.7% recognized that insulin should be administered around mealtime. Correct knowledge regarding injection sites (abdomen, thigh, glutei, and deltoid) was reported by 52.1%, and 52.9% correctly identified the 45-degree injection angle. Only 35.7% understood the correct thumb-gap rotation for injection sites, and

42.9% were aware of ways to minimize injection discomfort. Knowledge of insulin therapy risks was low (45.0%), and only 39.3% understood the purpose of rotating injection sites. Injection massage to slow insulin absorption was known by 46.4%, while 63.6% recognized the advantages of self-administration, including time-saving and convenience.

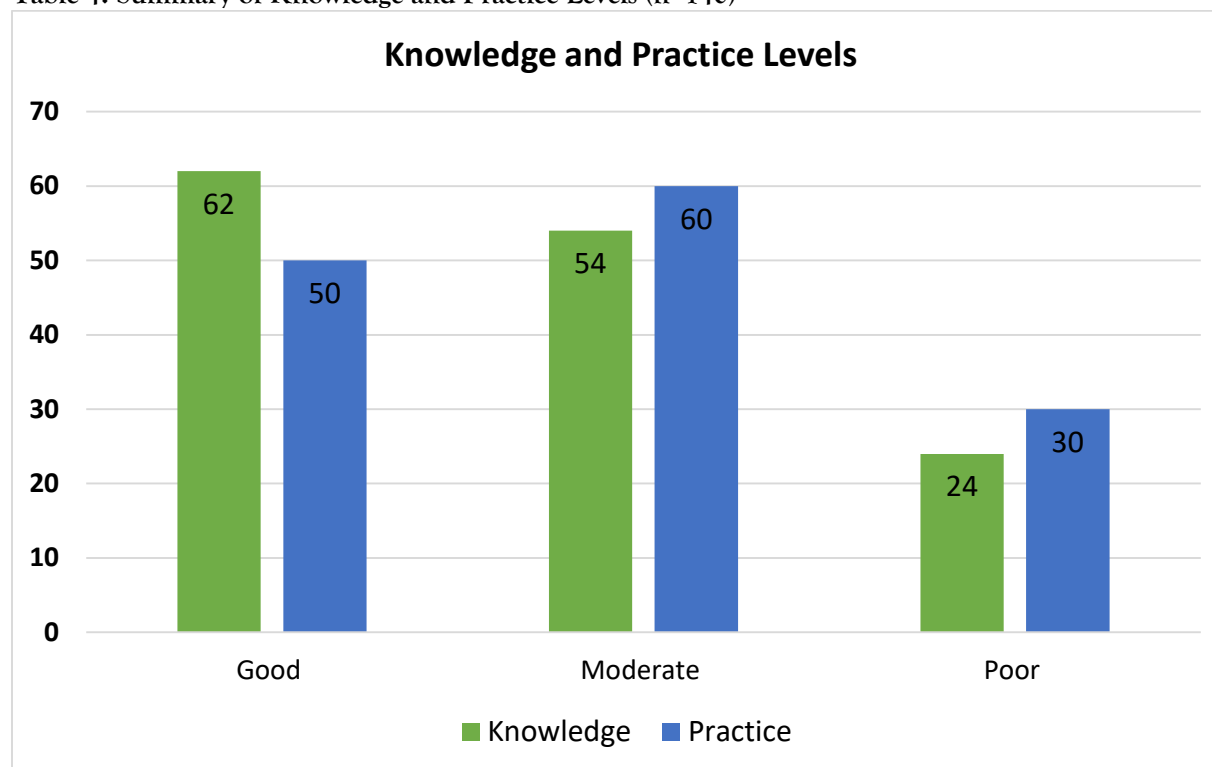
Table 3: Practice Regarding Self-Insulin Administration (n=140)

Sr. No	Practice Item	Correct n (%)	Incorrect n (%)
1	Administer insulin at correct angle, avoid rubbing site	47 (33.6)	93 (66.4)
2	Change injection site regularly	79 (56.4)	61 (43.6)
3	Avoid injection near navel/scars	55 (39.3)	85 (60.7)
4	Keep insulin at room temperature for 15 min before injection	73 (52.1)	67 (47.9)
5	Handwashing before injection	68 (48.6)	72 (51.4)
6	Disinfect injection site	65 (46.4)	75 (53.6)
7	Remove air bubbles from syringe	88 (62.9)	52 (37.1)
8	Use syringe only once	86 (61.4)	54 (38.6)
9	Dispose used needles in needle box	64 (45.7)	76 (54.3)
10	Take meal soon after injection	64 (45.7)	76 (54.3)

Practices related to insulin administration were inconsistent. Only 33.6% administered insulin at the correct angle and avoided rubbing the site post-injection. Slightly over half (56.4%) rotated injection sites regularly, while 39.3% avoided injection near scars or the navel. About 52.1% allowed insulin to reach room temperature before

injection. Handwashing before injection was performed by 48.6%, and 46.4% disinfected the injection site. Most participants ensured syringes were free from air bubbles (62.9%) and used syringes only once (61.4%). Proper disposal of needles was followed by 45.7%, and 45.7% consumed a meal soon after injection.

Table 4: Summary of Knowledge and Practice Levels (n=140)



Overall knowledge levels were categorized as good in 44.3% of participants, moderate in 38.6%, and poor in 17.1%. Practice levels were slightly lower, with 35.7% demonstrating good practice, 42.9% moderate practice, and 21.4% poor practice. These findings indicate that while participants had basic knowledge of insulin administration, adherence to recommended practices was limited, highlighting critical gaps in diabetes self-management education and implementation.

Discussion

The current research evaluated the learning and use of self-insulin in diabetic patients. Results indicated that a little above fifty percent of the respondents were well informed on insulin therapy, sites of injections and times of the day compared to meals. Alarfaj et al. (2023) also reported similar findings and concluded that patients usually possessed decent knowledge about the insulin usage but did not go deep in certain aspects like the site rotation to inject and the time of injection. The gaps in knowledge, which were identified in the present study, are similar to those

expressed by Gholap et al. (2016), who found that a significant portion of patients lacked the necessary practical elements of insulin administration. The current results indicate a lesser degree of overall insulin-related knowledge in comparison with other studies conducted in the environment with well-organized diabetes education programs like in the case of Hasnain (2021).

On practice, this research revealed discrepancies in a number of topics such as injection angle, site rotation, hygiene, and practice in disposal. The results are in line with those of Surendranath et al. (2012), who found that although the patients were aware, a good number of them do not apply the recommended methods of insulin administration properly. Conversely, the results have been much more encouraging in the areas where the services of diabetes counseling were well-established, including the results of Mohamed Weheida et al. (2022), who asserted significantly higher compliance rates, which indicates that the importance of structured patient education in the context of enhancing practice is significant. The

findings support the idea that knowledge is not the only guarantee that the technique is correct, something that was also observed by Alaofè et al. (2021).

Among the notable results of this research was the high percentage of the respondents who identified suitable insulin storage correctly, being in line with the study conducted by Netere et al. (2020), that reported high awareness levels on the part of patients in relation to refrigeration and storage provisions. This could be an indication of the explanation of the instructions of storage that are clear and simple within a clinical environment. Yet, the poor knowledge of injection angles and site rotation are comparable to findings made by Muhammad et al. (2020), as it suggests that the skills that require demonstration by a person are often misconceived.

The site rotation adherence rate in this paper was very low as repeatedly, the same injection site was used by many patients, and as a result, complications such as lipohypertrophy were reported (Hussain et al., 2025). The fact that the percentage of correct ways of injecting angles is low is also in line with the findings of Nasir and colleagues (2021) who revealed that incorrect way of angles techniques are widespread in case of the absence of practical reinforcement. These results imply that a rapid introduction of repeated demonstrations in the regular outpatient practice is required.

Hygiene behaviors like handwashing and cleaning of injection sites were also not adequately followed among the participants. The results are consistent with Gurmu and Teni (2014), who also noted the same shortcomings on hygiene compliance among insulin users in Ethiopia. In comparison, other studies like Alhazmi et al. (2020) in Saudi Arabia gave greater results of compliance because of frequent patient follow-ups and systematic clinical supervisory measures. This opposition emphasizes the value of regular control and communication with patients on enhancing injection care.

In this study, some of the practices including not reusing needles and making sure that the syringes had no air bubbles were more adherent. This observation can be justified by Qibtia et al. (2021) who stated that the patients were more likely to

adhere to the tasks when there are certain, immediate, consequences of the insulin dosing accuracy. Nonetheless, more complicated or preventive approaches are sometimes overlooked, which is the trend that Yilmaz and Tarhan (2017) also outlined in their study of the insulin administration behaviors.

All in all, the findings of this research support the existing gap between patient education and actual implementation of insulin intake. Although overall knowledge was satisfactory by most respondents, there was no consistency and comprehensiveness in the actions of recommended insulin methods. These results correspond to the works done by Shrestha et al. (2018) and Alaofè et al. (2021), which prioritize the necessity to combine proper knowledge, masterful practice, and life-long learning to effectively manage diabetes. The self-management courses of diabetes, combined with repeat practical demonstrations and frequent follow-up, are still needed to enhance the knowledge and practice levels in insulin-using diabetic patients.

Conclusion

The study revealed notable gaps in both knowledge and practice regarding self-insulin administration among diabetic patients. While participants demonstrated adequate awareness of basic insulin principles, such as proper storage and timing relative to meals, their understanding of more technical aspects, including site rotation, correct injection angle, and strategies to minimize discomfort, was limited. Similarly, adherence to safe administration practices was inconsistent, with a significant proportion of patients failing to follow hygiene protocols, rotate injection sites, or dispose of syringes appropriately. These findings indicate a clear discrepancy between knowledge and practical execution, highlighting the need for targeted interventions to ensure safe and effective self-insulin administration. Addressing these gaps is crucial for improving glycemic control, preventing complications, and enhancing overall diabetes management.

Recommendations

1. Structured patient education programs should be implemented in diabetic clinics, combining theoretical knowledge with hands-on training to improve practical skills in self-insulin administration.
2. Healthcare providers should conduct periodic demonstrations and competency assessments to reinforce proper injection techniques, site rotation, and hygiene practices.
3. Educational materials, such as pamphlets, videos, and visual aids, should be developed to emphasize critical aspects of insulin administration and complication prevention.
4. Follow-up and monitoring systems should be established to evaluate patient adherence and address gaps in practice during routine visits.
5. Family members and caregivers should be included in educational sessions to support patients in maintaining safe insulin administration practices at home.
6. Policies should be developed at hospital and clinic levels to standardize patient training, ensuring consistency and continuity in diabetes self-management education.
7. Further research should explore barriers to correct insulin administration and investigate interventions that effectively bridge the gap between knowledge and practice.

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