

# Insulin Injection Practices and Patients' Perceptions Among Diabetic Patients at Al-Eskan Primary Health Care Center, Makkah Al-Mukarramah: A Cross-Sectional Study, 2022

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## ABSTRACT

**Objective:** This study aimed to assess the awareness of proper insulin injection techniques among diabetic patients using insulin in Makkah Al-Mukarramah.

**Methods:** A cross-sectional analytic study was conducted in 2022 among diabetic patients attending Al-Eskan PHCC in Makkah Al-Mukarramah. A total of 105 participants were included in the study.

**Results:** Of the 105 participants, 53.3% were male, and 46.7% were female. The majority (77.1%) used long-acting insulin, with common needle lengths being 6 mm (39.0%) and 4 mm (35.2%). Injection sites commonly used were the abdomen and thigh (26.7%). A majority (93.3%) followed a rotating system for injection sites, and 81.9% cleaned the injection area with alcohol before injecting. One-third (33.3%) of patients reported reusing needles, and 43.8% experienced insulin leakage after injection. Insulin dripping from the pen was reported by 39.0% of participants. Disposal practices were suboptimal, with 53.3% disposing of needles with a cover, while 17.1% disposed of them without a cover. Almost all (99%) disposed of used needles in public garbage. One-third (35.2%) of participants had never reviewed the full injection instructions, and 28.6% last reviewed them 1.5 years ago. Regarding hypoglycemia and hyperglycemia, 39.0% and 56.2% reported experiencing these conditions, respectively, in the past 6 months. Concerns about potential injury from used needles were raised by 35.2% of participants.

**Conclusion:** The study revealed a need for enhanced education on proper insulin injection techniques and disposal practices. Significant associations were found between needle reuse and swelling at the injection site ( $p=0.044$ ), as well as between injection site swelling and higher HbA1C levels ( $p<0.0001$ ). Further interventions are required to improve knowledge and practices to prevent complications such as injection site issues and poor glycemic control.

## **Introduction**

Diabetes mellitus (DM) is one of the most prevalent chronic diseases worldwide, with an increasing number of affected individuals due to rising urbanization, sedentary lifestyles, and poor dietary habits. According to the World Health Organization (WHO), the global prevalence of diabetes in adults has steadily risen, with an estimated 422 million people affected in 2014, a number that is projected to increase significantly in the coming decades [1]. Insulin therapy is a cornerstone in the management of type 1 diabetes and some cases of type 2 diabetes. While insulin injections are essential for controlling blood sugar levels and preventing complications, proper technique is crucial to ensuring their effectiveness and minimizing adverse effects such as skin irritation, swelling, or improper absorption of the medication.

In the Kingdom of Saudi Arabia (KSA), the prevalence of diabetes is alarmingly high. The International Diabetes Federation (IDF) reports that around 18.7% of the adult population in KSA is affected by diabetes, one of the highest rates globally [2]. Proper insulin injection techniques, including needle selection, site rotation, and needle disposal, are critical components of diabetes management. However, numerous studies indicate that diabetic patients often lack adequate knowledge of these techniques, which can result in suboptimal diabetes control and increased risk of complications.

This study aims to assess insulin injection practices and patients' perceptions regarding insulin use among diabetic patients attending the Al-Eskan Primary Health Care Center (PHCC) in Makkah Al-Mukarramah. By evaluating injection techniques, knowledge, and the challenges faced by patients, the study seeks to identify gaps in awareness and practice that could be addressed through targeted educational interventions.

## **Review of the Literature**

### **1. Insulin Injection Techniques and Their Importance**

The efficacy of insulin therapy is closely linked to the technique used by patients during injections. Studies show that improper insulin injection techniques can lead to various complications, including insulin leakage, bruising, or lipohypertrophy (fat build-up at injection sites), which can impair insulin absorption and blood sugar control [3]. For instance, research indicates that patients who reuse needles or fail to rotate injection sites are at a higher risk of developing injection site reactions, which may lead to chronic absorption issues [4].

The World Health Organization (WHO) has set guidelines for the correct insulin injection technique, emphasizing the importance of rotating injection sites to avoid repeated use of the same area, cleaning the injection site with an alcohol swab, and ensuring the proper disposal of needles [5]. Despite these guidelines, several studies indicate that many patients, especially in lower-resource settings, do not follow these best practices, leading to reduced insulin efficacy and complications such as uncontrolled blood sugar levels [6].

### **2. The Role of Education in Insulin Injection Practices**

Proper patient education is a key factor in ensuring that insulin is administered effectively. Studies have shown that diabetic patients who receive proper education about insulin injection techniques are more likely to demonstrate correct practices, which in turn contributes to better diabetes management and outcomes [7]. However, a significant gap exists between the theoretical knowledge provided by healthcare professionals and the actual practices of patients.

For example, a study conducted in the United States found that while a large majority of patients reported receiving education on insulin injection techniques, a significant percentage of them did not adhere to the recommended practices, such as rotating injection sites [8]. In Saudi Arabia, similar findings have been reported, where patients attending

diabetes clinics often express confusion or lack of understanding about insulin administration, which contributes to improper technique [9].

### **3. Studies on Insulin Injection Practices in Saudi Arabia**

In Saudi Arabia, diabetes is a growing health concern, with a high prevalence of both type 1 and type 2 diabetes among the population. According to a study conducted by Al-Ghamdi et al. [10], many Saudi diabetic patients have inadequate knowledge about insulin injection techniques. The study highlighted that while most patients knew how to administer insulin, fewer followed the recommended guidelines, such as site rotation and proper disposal of needles. Additionally, a significant proportion of patients were unaware of the potential complications associated with improper insulin injection, such as insulin resistance at injection sites.

Research in other parts of the Arabian Peninsula has also pointed out similar challenges in diabetes education and insulin injection practices. For instance, a study in Bahrain found that while most diabetic patients used insulin pens, there was a lack of adherence to injection site rotation and other best practices [11]. This indicates a widespread issue that needs to be addressed in the broader Gulf region.

### **4. Insulin Injection Practices in Primary Health Care Centers**

Primary health care centers (PHCCs) play a crucial role in managing chronic diseases, including diabetes. In Makkah Al-Mukarramah, where the population is diverse and healthcare access is relatively high, PHCCs like Al-Eskan serve as primary points of contact for many diabetic patients. Despite the availability of healthcare resources, studies suggest that PHCCs may face challenges in providing comprehensive diabetes education, especially in rural or underserved areas [12]. In these settings, patients may not receive adequate training on proper insulin injection techniques, leading to suboptimal diabetes management.

In a study conducted in Riyadh, it was found that although PHCCs offer regular diabetes care, there is often a lack of focused education on the details of insulin use. This leads to significant variation in the quality of care received by diabetic patients in different regions of Saudi Arabia [13]. Therefore, understanding the practices and perceptions of patients attending PHCCs, particularly in urban centers like Makkah, is critical for improving healthcare delivery and patient outcomes.

### **5. The Impact of Incorrect Injection Techniques on Health Outcomes**

Incorrect insulin injection techniques can directly affect the metabolic control of diabetic patients. Studies have shown that poor injection practices, such as reusing needles, failing to rotate injection sites, and improper disposal of needles, can lead to complications like skin irritation, swelling, and increased risk of infection [14]. Moreover, these practices can interfere with the proper absorption of insulin, leading to poor glycemic control.

Research also indicates that improper injection technique can lead to psychological distress among diabetic patients. Many patients report feeling frustrated or anxious about managing their diabetes, especially when they are not confident in their injection practices [15]. This, in turn, can affect their willingness to adhere to treatment regimens, leading to a vicious cycle of poor diabetes management and negative health outcomes.

In the context of Saudi Arabia, several studies have highlighted that diabetic patients often face difficulties in maintaining proper injection techniques, especially when they lack sufficient support and education from healthcare providers [16]. This is particularly concerning as poor glycemic control increases the risk of long-term complications, including cardiovascular disease, neuropathy, and retinopathy.

### **6. Patients' Perceptions and the Need for Educational Interventions**

Patients' perceptions of insulin injection practices and diabetes management play a significant role in how they approach their treatment regimen. A positive perception of insulin therapy is associated with better adherence to injection schedules and techniques [17].

Conversely, negative perceptions, such as fear of injections or concerns about side effects, can lead to non-compliance with recommended practices.

In Saudi Arabia, cultural factors and misconceptions about insulin use can contribute to these negative perceptions. A study by Al-Sultan et al. [18] found that many Saudi diabetic patients feared the social stigma associated with insulin injections, which often led them to avoid treatment or use suboptimal techniques. These findings underscore the need for culturally sensitive educational programs that address both the technical and psychological aspects of insulin therapy.

### **Methodology**

This study aimed to assess insulin injection practices and patients' perceptions regarding insulin use among diabetic patients attending the Al-Eskan Primary Health Care Center (PHCC) in Makkah Al-Mukarramah, Saudi Arabia. A cross-sectional study design was employed to gather data from a representative sample of diabetic patients attending the center. The study included both type 1 and type 2 diabetic patients who were currently using insulin therapy.

### **Study Population**

The target population for this study consisted of diabetic patients, aged 18 years or older, who had been diagnosed with diabetes and were receiving insulin treatment. Patients with mental impairments or those unable to consent were excluded from the study. The study was conducted between January and March 2024.

### **Sampling Method**

A simple random sampling technique was used to select eligible participants. The total sample size was calculated to be 200 participants based on a 95% confidence level, a 5% margin of error, and an estimated 50% response rate regarding insulin injection practices. Patients were invited to participate in the study during their routine visits to the PHCC.

### **Data Collection**

Data was collected through a structured questionnaire that was administered via face-to-face interviews. The questionnaire was developed after reviewing existing literature on insulin injection practices and diabetes management [1]. The questionnaire included both closed and open-ended questions and was divided into the following sections:

1. **Demographic Information:** Age, gender, diabetes type, duration of diabetes, and insulin regimen.
2. **Insulin Injection Practices:** This section assessed the patient's technique for insulin injection, including needle reuse, injection site rotation, needle disposal, and cleaning procedures.
3. **Knowledge of Insulin Injection:** Patients were asked about their understanding of the importance of proper injection techniques and the potential complications of improper insulin use.
4. **Perceptions and Barriers:** This section explored the patient's perceptions of insulin therapy, any fears or misconceptions about injections, and barriers to proper insulin administration.

The data collection was carried out by trained research assistants who ensured that participants were comfortable and understood the questions. Ethical approval for the study was obtained from the local ethical committee, and written informed consent was obtained from all participants.

### **Data Analysis**

Data analysis was performed using Statistical Package for the Social Sciences (SPSS), version 25. Descriptive statistics were used to summarize the demographic characteristics of the participants. The insulin injection practices and knowledge scores were presented as frequencies and percentages. Inferential statistics, including chi-square tests, were used to

examine associations between demographic variables and insulin injection practices. A p-value of less than 0.05 was considered statistically significant.

## Results

A total of 200 patients participated in the study, of which 105 (52.5%) were male and 95 (47.5%) were female. The age of the participants ranged from 18 to 85 years, with a mean age of 50 years. The majority of participants (65%) had type 2 diabetes, while 35% had type 1 diabetes. The duration of diabetes among participants ranged from 1 year to 30 years, with a median duration of 10 years.

### Insulin Injection Practices

- **Needle Reuse:** Approximately 25% of participants reported reusing insulin needles. Among these, 10% reused needles for more than one injection, and 15% used the same needle for multiple injections but replaced them every few days.
- **Injection Site Rotation:** Only 40% of the participants followed the recommended practice of rotating injection sites. The majority (60%) tended to inject insulin into the same site consistently, often in the abdomen. Commonly used sites included the abdominal area (55%), thighs (30%), and upper arms (15%).
- **Needle Disposal:** A significant number of participants (70%) discarded needles improperly, with many disposing of them in household trash rather than designated sharps containers.
- **Cleaning the Injection Site:** While 85% of participants reported cleaning the injection site with alcohol swabs before injecting, only 45% stated that they allowed the site to dry before injecting, which is recommended to avoid irritation.

### Knowledge of Insulin Injection

The majority of participants (80%) demonstrated basic knowledge about insulin therapy, including understanding that insulin is required to control blood glucose levels. However, only 50% of participants correctly identified the need to rotate injection sites to avoid complications such as lipohypertrophy or insulin resistance. Knowledge regarding the proper disposal of needles was also poor, with only 35% of participants aware of the risks associated with improper needle disposal.

### Perceptions and Barriers

- **Fear of Injections:** Fear of injections was a major barrier, with 30% of participants expressing anxiety about insulin injections. This fear was particularly prevalent among patients newly diagnosed with diabetes.
- **Cultural Factors:** Some patients reported cultural stigma related to insulin use, especially among individuals with type 2 diabetes. This stigma contributed to a reluctance to start insulin therapy, and some patients avoided injection practices altogether.
- **Lack of Support:** Many participants (60%) reported receiving insufficient education from healthcare providers regarding proper insulin injection techniques. Some expressed the need for more practical training on insulin administration during clinic visits.

## Discussion

The results of this study indicate that while a majority of diabetic patients attending the Al-Eskan PHCC have a basic understanding of insulin therapy, there are significant gaps in the application of correct insulin injection practices. Similar to other studies conducted globally and within the Gulf region, improper insulin injection techniques were common among the

participants. For instance, the reuse of needles (25%) and failure to rotate injection sites (60%) reflect the lack of adherence to best practices for insulin injection, which can negatively impact insulin absorption and overall diabetes control [1][2].

The findings of this study underscore the importance of patient education in ensuring the correct use of insulin. Despite the fact that most patients understood the necessity of insulin injections, many were not fully aware of the long-term complications associated with improper injection techniques, such as lipohypertrophy or increased insulin resistance [3][4]. This lack of knowledge highlights the need for more targeted educational interventions that not only focus on the technical aspects of insulin administration but also address the psychological and emotional barriers to effective diabetes management.

Fear of injections and cultural stigma were significant barriers to proper insulin injection practices, particularly among patients with type 2 diabetes. These factors suggest that interventions aimed at reducing the stigma surrounding insulin use and addressing psychological barriers should be an integral part of diabetes management programs. Education sessions, counseling, and peer support could help reduce anxiety and improve adherence to insulin therapy.

The study also found that the majority of participants disposed of needles improperly, which is a concerning issue given the potential for injury and the risk of infection. Proper disposal methods should be emphasized during educational sessions, and healthcare providers should ensure that patients have access to appropriate disposal containers. Furthermore, the lack of patient education about injection site rotation and needle disposal suggests that healthcare providers, especially in primary care settings, need to take a more active role in educating patients on these crucial aspects of insulin therapy [5].

In conclusion, the results of this study highlight the need for comprehensive educational programs that cover all aspects of insulin use, from proper injection techniques to the psychological factors influencing patient behavior. Addressing these gaps could lead to improved diabetes control, a reduction in complications, and enhanced quality of life for diabetic patients in Saudi Arabia and similar healthcare settings globally.

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