

## Using frequent intramuscular insulin to treat diabetic ketosis and ketoacidosis in a low-resource family medicine setting.

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### ABSTRACT

**Background:** Diabetes mellitus (DM) is on the rise in India. It can be difficult to effectively manage DM problems in areas of India with little resources. The necessity to investigate low-cost strategies for managing diabetic ketosis (DK) and diabetic ketoacidosis (DKA) is addressed in this study.

**Goals:** To show how, in a family practice context, intramuscular (IM) regular insulin can be used as a secure substitute for other methods of controlling DK and DKA.

**Supplies and Procedures:** 34 patients who were admitted with DK and DKA during a five-year period to a family medical unit serving the urban poor had their charts retrospectively reviewed. Information on blood pressure, age, sex, precipitating causes, number of hospital days, amount of insulin administered, and amount of time needed to manage blood glucose (BG) and rectify diabetic ketoacidosis were inserted into EpiData version 3.1 and examined with SPSS version 17 software.

**Findings:** In patients with DK and DKA, BG was effectively lowered to less than 250 mg/dL by administering IM regular insulin. For the ketosis group, this took an average of 3.8 hours, whereas for the ketoacidosis group, it took an average of 3.9 hours. In the group with ketoacidosis, the average quantity of insulin needed to correct acidosis was 72.3 units, and it took an average of 33 hours to accomplish so. Just one of the 34 patients in the group with ketoacidosis experienced hypoglycemia. There were no patient referrals or fatalities.

**Conclusion:** In a family medical environment, IM regular insulin is a safe alternate strategy for controlling DK and DKA, as this study has shown.

**Keywords:** Diabetic ketoacidosis, diabetic ketosis, intramuscular insulin

### INTRODUCTION

In many nations, diabetes mellitus (DM) is on the rise. Worldwide, its occurrence is rising, with low- and middle-income nations leading the way. India had 31.7 million diabetics in 2000, and by 2030, that number was expected to rise to 79.4 million.[1] In 2000, there were 171 million people with diabetes globally; by 2030, that number is predicted to rise to 366 million.[1]

Hypoglycemia, hyperglycemic hyperosmolar condition, and diabetic ketoacidosis (DKA) are typical life-threatening situations associated with diabetes. According to a population-based study conducted in the USA, the yearly incidence of DKA in the diabetic community is 4.6/100,000.[2] In the USA, it was the cause of over 100,000 hospital admissions annually.[3]

The metabolic trio of elevated ketone concentration, metabolic acidosis, and hyperglycemia characterizes diabetic ketoacidosis (DKA). DKA can occur in type 2 DM when there are underlying precipitating conditions, although being more common in type 1 DM. A tertiary hospital survey determined the most prevalent.

infections as a triggering factor, then disobedience with medicine.[4] Blood glucose (BG), bicarbonate level, and sensorium are used to categorize DKA severity into three categories: mild, moderate, and severe [Table 1].[5] A continuous IV infusion is advised as the first line of treatment for diabetic ketoacidosis (DKA), after a bolus of intravenous (IV) or intramuscular (IM) short-acting insulin. One of the benefits of IV treatment is that it acts quickly and keeps blood insulin levels constant. However, the IV approach has manpower and equipment constraints, especially in low-resource units and poor nations. There have been positive reports about the intermittent instant messaging route. In low-resource units, the IM approach will be a more realistic choice. We have been using IM to treat mild and moderate DKA.

### MATERIALS AND METHODS

This study was conducted at an urban secondary health center, a 46-bed hospital with an operating room and labor room.

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theater that provides services to almost 200,000 urban disadvantaged people. This hub Located two kilometers from the tertiary medical facility, which is the referral center, which is managed by a team of family doctors, community physicians as well as medical officers. Everyday ambulatory care centers with about 49,000 consultations are carried out annually, with 31.2% of them being for DM.[7]

There are no intensive care units available at the inpatient unit. Consequently, moderate and mild DKA is managed by insulin administered intermittently. Referrals for severe DKA go to the referral This procedure was created to facilitate conversations with endocrine members of a hospital referral team. Upon entry, drink plenty of water Upon entry, hydration is blood samples are obtained and adjusted using regular saline to measure the amounts of bicarbonate and electrolytes. The prognosis of If blood sugar is more than 250 mg/dL, DKA is produced, and urine The amount of serum bicarbonate is less than 15, and the ketones are positive.

If blood sugar levels were high, diabetic ketosis (DK) was diagnosed. was more than 250 mg/dL, and positive urine ketones were found, however Levels of serum bicarbonate were normal. The outcomes of the serum After three hours, bicarbonate levels and electrolytes are accessible.

## RESULTS

A bolus dosage of 0.3 units/kg was used to start the intramuscular insulin regimen; half of this dose was administered intravenously and the other half intramuscularly.[8] The standard saline was combined with the IV insulin dosage.

Using a disposable one-inch needle and a tuberculin glass syringe, the intramuscular insulin dose was injected into the gluteal or deltoid muscle. Using a glucometer, a capillary prick was used every hour to check blood glucose levels. In order to achieve a 50–70 mg/dL drop in blood glucose level each hour, 0.1 units/kg of insulin was delivered hourly via the intramuscular method. The dosage was doubled if this goal was not met. After the patient's BG dropped to less than 250 mg/dL, an 8-unit dextrose saline infusion was started.

insulin. For a full day, the glucose was continuously monitored every hour. After twenty-four hours, the insulin was administered by a subcutaneous method. Six hours a day, the plasma electrolytes were observed.

We looked over the inpatient records where DKA was identified. Retrospective analysis was conducted between January 2011 and July 2015.

44 patients were admitted during this time with the diagnosis of DKA or DK. However, because the remaining patient records included insufficient information, only 34 patient records were considered in this investigation. Using EpiData version 3.1 (The EpiData Association, Odense, Denmark),

data on age, sex, BG, electrolytes, precipitating factor, and blood pressure were recorded. SPSS version 17 (Chicago, IL) was then used for analysis. The results taken into account in this investigation are the Outcomes 48 was the average age of patients with DKA who were admitted [Table 2]. For DKA patients, the average blood glucose level upon admission was 458 micrograms per deciliter. The average quantity of insulin and average time needed BG <250 mg/dL in patients with DK and DKA were comparable (P = 0.23 and 0.29, in that order). The average quantity of The DK and DKA had hospital stays of 4.18 and 5.29 days, respectively.

groups, in turn. After then, the BG dropped to below 250 mg/dL in around 4 hours [Table 3].

The results of patients who were admitted did not differ. both in the presence of and absence of triggering conditions among the DKA patients. How long does the average hospital stay in 5.29 individuals had DKA [Table 4].

In the course of of care at the community health center, Of the 34 patients, only one experienced two instances of hypoglycemia in the group with DKA. No recommendations or fatalities among these patients.

## DISCUSSION

The management of DKA Talk Correcting electrolyte imbalance, hyperglycemia, and dehydration are all part of managing diabetic ketoacidosis (DKA). The revision of Insulin causes hyperglycemia. Many administration routes, dosages, and times have been documented over the years. The amount of time required to treat hyperglycemia, ketoacidosis, and any side effects determines how effective a certain method or dosage is. Infusion pumps for low-dose continuous IV insulin are advised by the majority of guidelines.[5] Regular intramuscular or subcutaneous injections have also been advised.[9]

There is ongoing discussion on the optimal way to administer insulin.

Research by Fisher et al. and Soler et al. has shown that patients with DKA who get IV insulin therapy had a faster drop in plasma glucose, especially in the first hour of treatment. [10,9] Nevertheless, there were no appreciable variations in the rate of glucose decline following the initial fall.

In our investigation, the duration required for BG to drop to below For individuals with DKA and DK, the dose of 250 mg/dL was roughly 4 hours. This study bears similarities to one conducted in Nigeria, when the time needed between 4 hours for BG to reach 250 mg/dL in DKA. and five hours.[11] This time, the Nigerian study found that whether The IV or IM route was used for administration. The average quantity of Insulin used in our study to lower blood glucose levels to less than 250 mg/dL was 32.8 units, which is in line with the research conducted in Nigeria.[11]

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In our investigation, there were no fatalities or serious consequences. It has been observed that intravenous insulin therapy yields higher BG level variations that are gradual. The greater the quicker decline in glucose dose of IV insulin treatment may cause dangerously low blood sugar if not adjusted correctly. When infusion pumps are present, IM insulin would be safer if it were not available or practical.

As mentioned the results of IM insulin therapy are favorable, and it doesn't require infusion pumps or intricate infusion rate computations.

The IV insulin treatment for DKA is more expensive because individuals are typically admitted to critical care units for IV infusion of insulin [12]

## CONCLUSION

In DKA, we find that intravenous insulin therapy is safe and produces comparable results, but more slowly. Insulin therapy doses for intravenous injection are simply determined, adaptable, and less error-prone. These traits advise nonspecialist doctors working in low-resource rural or urban health institutions to use the IM route. More comparative research in the Indian context will clarify how cost-effective it is compared to intravenous insulin therapy.

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