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A Clinical Profile of 50 cases of Hypoglycemia in a Tertiary Care Hospital

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A Clinical Profile of 50 cases of Hypoglycemia in a Tertiary Care Hospital

Abstract

Hypoglycemia is defined as a blood glucose level/dl. It is usually seen in Diabetics due to an improper balance between blood glucose-lowering drugs and food. Patients can have various symptoms, ranging from headaches and palpitations to coma and death. Patients are typically treated with oral carbohydrates and IV carbohydrates/Glucagon if needed. It is essential to understand the presenting complaints of Hypoglycemia as it often complicates the management of Diabetic patients, and sometimes non-Diabetic patients. The symptoms may frequently be mild but can cause significant long-term complications. It is also essential to understand the cause of Hypoglycemia in order to prevent future episodes.

In this case series, we describe 50 cases – their presenting complaints, Capillary Blood Glucose (CBG) values, and likely causes for the events. We also describe the management as done in our hospital.

Keywords

Diabetes, Hypoglycemia, Insulin, Oral Hypoglycemic Drugs (OHAs), Case Series

INTRODUCTION

The human body tightly regulates the blood level of Glucose, which is a fundamental bio-chemical element essential for survival. The American Diabetic Association (ADA) defines Hypoglycemia as blood sugar levels <70 mg/dl [1]. This is level 1 Hypoglycemia. Blood glucose <54 mg/dl is characterized as level 2 Hypoglycemia. Level 3 Hypoglycemia is a serious condition with critically low blood glucose levels characterized by obvious physical changes, altered sensorium, seizures, coma etc.

Hypoglycemia is most commonly seen in Diabetics, due to improper or excessive use of Hypoglycemic agents like oral drugs (Metformin, Sitagliptin, Dapagliflozin, Glibenclamide etc.) and Insulin. Less commonly, Hypoglycemia may also occur in non-diabetics due to excessive exercise, exogenous Insulin use/abuse, prolonged starving/fasting and rarely due to tumors like Insulinomas.

The symptoms of Hypoglycemia can vary. Many patients are often initially asymptomatic with mild levels of Hypoglycemia. Studies show, repeated attacks of Hypoglycemia can further de-sensitize the body to future Hypoglycemic episodes [2].

Other symptoms seen in Hypoglycemia include – Anxiety, Tremors, Palpitations, Sweating, Hunger, Irritability, Headache, Weakness, Confusion, Paraesthesia's, Light headedness, Altered Sensorium, Lethargy, Nightmares, Coma, and even death. Symptoms are usually due to sympathetic activation, later followed by CNS manifestations due to neuroglycopenia.

The Whipple's triad is a well-known entity used for describing Hypoglycemia -

- Neuroglycopenic symptoms
- Response to Glucose
- Blood Glucose level <70 mg/dl

Uncontrolled and untreated Hypoglycemia can cause permanent neurological damage, coma, acidosis and even death [3]. Hypoglycemia can also affect other systems like the Cardio-Vascular System (CVS) and cause arrhythmias due to alteration in Potassium levels [4]. Hypoglycemia has also been found to cause coagulopathy [5] and long-term permanent debilitating sequelae. The psycho-social impact also cannot be overstated. It is necessary to identify symptoms and promptly restore blood glucose levels to normal.

The management of Hypoglycemia starts at home, and is best to be initiated as early as possible. The first step is to take simple, fast acting carbohydrates with minimal protein content, preferably orally or through other routes as early as possible. The ADA recommends the 15-15 rule, i.e., 15g of Carbohydrates and then recheck blood sugars after 15 minutes. If the patient is unable to take orally, an intra-venous line may also be used to infuse carbohydrate containing solutions like Dextrose. It is also empirical to monitor sugars routinely with this method, so as to not cause Hyperglycemia.

Another alternative, usually reserved for patients unable to take orally with blood glucose level <54 mg/dl is injectable/intranasal Glucagon [1]. Glucagon is intrinsically produced by the Alpha cells in the

endocrine Pancreas. It antagonizes the effects of Insulin, acting as counter-regulatory hormone, raising blood sugar levels by directly inducing glycogenolysis and gluconeogenesis.

Patients who develop Hypoglycemia require prolonged monitoring at regular intervals and counselling regarding diet, medication, and identifying symptoms early.

METHODOLOGY

All patients coming into the emergency department from 28th October 2022 till 17th November 2022 were observed. After initial assessment, patients found to be Hypoglycemic (<70 mg/dl) were selected to be reviewed. Verbal consent was obtained. History was taken including history of last meal, history of medication use, history of diabetes, family history, presenting complaints etc. A follow-up at 1 week was attempted telephonically. The data collected was entered in MS Excel 365 and analyzed.

Inclusion Criteria

- Patients >=18 years of age
- Patients/Attenders giving consent

Exclusion Criteria

- Refusal of consent
- Children <18 years of age

RESULTS

A total of 50 cases were studied. The demographic profile is given in table 1

Table 1 – Demographic Profile of patients

Sex	Number	Age	Diabetics	Duration of Diabetes (years)
Male	23 (46%)	57.81 ± 11.86	23	12.13 ± 4.01
Female	27 (54%)	60.57 ± 10.81	27	12.85 ± 4.27
Total	**50**	**59.36 ± 11.13**	**50**	**12.52 ± 4.20**

It can be seen that there is near equal distribution between males and females with slight female inclination. The ages are also inclined towards the elderly. The mean duration of Diabetes was comparable in both males and females.

The type of drug taken by the patients can be seen in figure 1

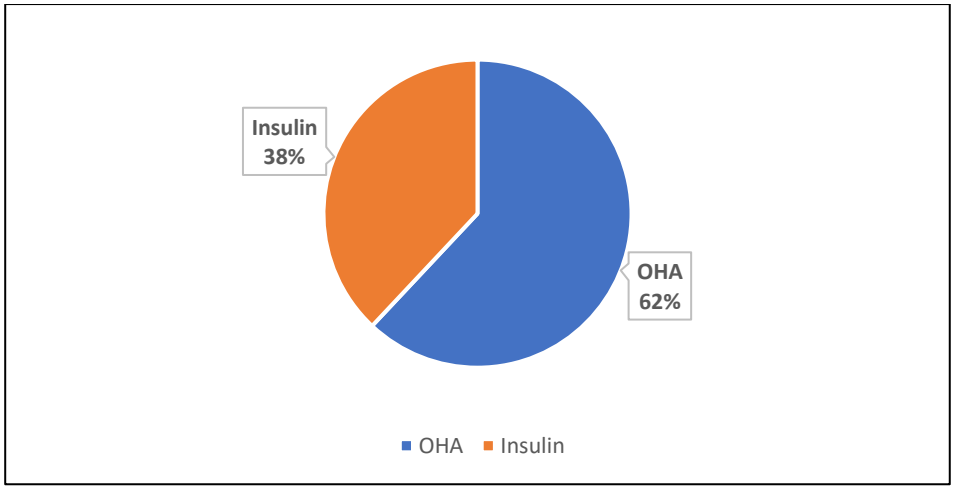

Figure 1 – Type of drug used by patients

The presenting complaints of the patients are summarised in table 2

Table 2 – Presenting complaints of patient

Presenting complaint	Numbers (n=50)	Sex	
		M (n=23)	F (n=27)
Palpitations, Diaphoresis	8 (16%)	4	4
Altered Sensorium	14 (28%)	4	10
Loss of Consciousness	8 (16%)	5	3
Weakness/Giddiness	6 (12%)	3	3
Headache	12 (24%)	7	5
Seizures	2 (4%)	0	2

Altered sensorium was the common presenting complaint amongst Hypoglycemic patients followed by headache. While 4% of the patients had seizures, 16% came with a loss of consciousness.

The Capillary Blood Glucose (CBG) levels are segregated and presented in table 3

Table 3 – CBG levels of patients

CBG Levels (mg/dl)	Number (n=50)	Sex	
		M (n=23)	F (n=27)

Lo	4 (8%)	2	2
=<30	6 (12%)	2	4
>30 to =<40	19 (38%)	10	9
>40 to =<50	20 (40%)	9	11
>50	1 (2%)	0	1

The glucometer used in our hospital can detect CBG within a wide range. Any value <20mg/dl is reported as Lo on the machine. Symptoms of Hypoglycemia tend to start when the blood sugar levels drop below 55 mg/dl [6], and the severity keeps increasing as the blood sugar levels drop.

The likely antecedent causes for Hypoglycemia are summarised in table 4

Table 4 – Likely cause for Hypoglycemia

Likely cause	**Numbers (n=50)**	**Sex**	
		M (n=23)	**F (n=27)**
Missed meal/Inadequate meal	41 (82%)	19	22
Inappropriate Insulin dosing	4 (8%)	2	2
Unknown	4 (8%)	1	3
High Intensity Exercise	1 (2%)	1	0

Knowing the cause of Hypoglycemia is very important as it usually occurs due to patient error [7]. As seen above, missing a meal or consuming inadequate amounts of food was responsible for 82% of our cases. In the emergency department, due to limited time and resources, detailed investigations and histories are not possible, therefore, an immediate cause may not be found. In this case series, 4 cases did not have a clear antecedent cause. High-Intensity Exercise improves peripheral uptake of glucose [8] and therefore can sometimes cause Hypoglycemia as seen here in one of the cases.

Out of the 50 patients, 7 were admitted while 43 were discharged or denied consent for their admission. Of those discharged, it was possible to follow up with only 11 patients after 1 week, none of whom had another episode of Hypoglycemia. All 7 patients who were admitted, got discharged on average, after 2 days of stay in the hospital, with no further episodes during their stay.

DISCUSSION

Hypoglycemia is one of the common causes of presentation to the emergency department. It is defined as blood sugar <70 mg/dl [1]. Patients can present with a variety of symptoms, ranging from being completely asymptomatic to as severe as seizures and coma. There can be long-term sequelae in terms of cognitive decline, unawareness of future episodes of Hypoglycemia, arrhythmias, seizures, and death [3,4].

In this case series, it can be seen that patients tend to be on the elder side, with near equal sex distribution but slight female predominance. A study published in 2015 found that women tend to have higher odds of developing Hypoglycemia [9]. This probably explains why 54% of the patients in our study were females.

As shown in the results above, patients can have a variety of symptoms. In our case series, we see that the most common presenting complaint is altered sensorium. This is strikingly different from the common symptoms described in other literature. A paper from 1992 cited sympathetic overactivity symptoms as the most common [10]. Altered sensorium can be a challenge from a diagnostic point of view due to multiple possible etiologies, ranging from head trauma to metabolic diseases to infections. The next most common presenting complaint was a headache. This is also a highly non-specific complaint and requires a high degree of suspicion. Other complaints include palpitations (Sympathetic overactivity) and weakness (Neuroglycopenia). The most serious was 2 patients presenting with seizures. After controlling seizures and blood glucose, the patients were admitted for observation and further management.

The quickest way to identify patients with Hypoglycemia is a point-of-care glucometer used to measure Capillary Blood Glucose (CBG) [11]. This is especially useful when patients present with non-specific symptoms. In this case series, we can see that 40% of the cases had a CBG >40 mg/dl and another 38% had CBG levels >30 mg/dl. While patients tend to become symptomatic once the blood glucose levels fall below 55 mg/dl [8], patients with CBG <30 mg/dl tend to present with serious symptoms.

It is also important to understand why the episode of Hypoglycemia occurred in the first place as it occurs more commonly due to human error than intrinsic pathology [7]. In our case series, we see that the most common cause of Hypoglycemia is skipping meals or consuming inadequate amounts of food. Patients often take the dose of their prescribed anti-Diabetic medicine on time, but either delay or skip their subsequent meal. Sometimes, they may even eat a smaller quantity of food compared to normal. This creates an imbalance in the source of blood glucose and blood glucose-lowering medications. Another cause is the self-titration of injectable Insulin. Patients are often educated regarding dose corrections in case of a change in their meal frequency and quantity. Sometimes, patients may overcompensate and inject a higher than the needed amount of drug. This issue needs to be tackled with proper education and training of patients. In the acute setting, such as that in the emergency department, an immediate cause may not be identified. In this case series, we see that we had 4 such patients. These patients need to be properly evaluated to explore reasons for the Hypoglycemic episode and to prevent another episode in the future.

In our hospital, patients presenting to the emergency department with Hypoglycemia are treated with an intravenous infusion of 50% Dextrose and monitored with serial CBGs. Most patients are discharged and advised to return on an Out-Patient (OPD) basis for follow-up and relevant investigations. Wherever possible, specific counselling and dietary advice is provided, for example, in cases of Hypoglycemia due to skipped meals, the importance of timing medication and appropriate meals at appropriate times is enforced.

Patients are also admitted when they present with serious symptoms or when the cause for Hypoglycemia remains elusive.

It is important to note that patients can develop serious complications from Hypoglycemia and therefore need to be properly educated, in order to identify symptoms and triggers, and to promptly self-treat with oral carbohydrates whenever possible.

There were definitely some limitations in this study that are worth noting. The patient sample size was small. This, therefore, is insufficient to provide a true picture of Hypoglycemia. The patients were enrolled in the emergency department only, therefore events occurring at home or in the inpatient wards might have been missed. Most patients were enrolled in the evening/night time, therefore the results could have suffered from a bias, where particular types of events like missing meals may have appeared more prominent. Another drawback is the fact that a vast majority of patients were lost to follow-up.

CONCLUSION

In our case series, we found out that the affected population tends to be inclined toward the elderly, with a slight female inclination. The most common presenting complaint was altered sensorium, followed by headache. The most common likely cause for Hypoglycemia in our case series was missing meals or inadequate food intake. A majority of the patients had a CBG value greater than 30 mg/dl.

It is important for healthcare providers to identify signs and symptoms of Hypoglycemia and methods to quickly restore normal blood glucose levels. All diabetic patients should be counselled regarding Hypoglycemia, its complications, and its management. Strict home-based blood glucose monitoring should be advised where possible. The medications and diet should be periodically reviewed and patients should be counselled on Insulin dose titration if needed. Patients who are prone to developing Hypoglycemia should be advised to keep fast-acting carbohydrates and/or Glucagon injections within reach.

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