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"MANAGEMENT OF DIABETIC EMERGENCIES PRESENTING TO EMERGENCY MEDICINE DEPARTMENT OF A TERTIARY CARE HOSPITAL"

Emergency Medicine

Dr Kishor Kalsariya — Third Year Residents, Department of Emergency Medicine, SVP Hospital, Smt NHL Municipal Medical College, Ellis bridge, Paldi, Ahmedabad- 380006

Dr Mehul Gajjar — Assoc. Professor, Department of Emergency Medicine, SVP Hospital, Smt NHL Municipal Medical College, Ellis bridge, Paldi, Ahmedabad- 380006

Dr Bhupendra Nayak — Department of Emergency Medicine, SVP Hospital, Smt NHL Municipal Medical College, Ellis bridge, Paldi, Ahmedabad- 380006

Dr Bhavesh Jarwani — Professor And Head, Department of Emergency Medicine, SVP Hospital, Smt NHL Municipal Medical College, Ellis bridge, Paldi, Ahmedabad- 380006

ABSTRACT

Diabetes is a group of metabolic disorders caused by a complex interaction of genetics and environmental factors characterized by hyperglycemia resulting from defects in insulin secretion, insulin action, or both1,2.The major classifications of diabetes are type-1 diabetes(5-10) which is caused by B-cell destruction and type-2 diabetes(90-95%) which results from insulin resistance. Diabetes and its complications are major causes of early death in most countries, with cardiovascular disease being the leading cause of death among people with diabetes.(3) The most common and life-threatening diabetes-related Acute emergencies seen in hospital emergency departments are Hypoglycemia, Diabetic ketoacidosis (DKA), and Hyperosmolar hyperglycemic state (HHS). This study was conducted to understand demographic , clinical and management profile of patients presented to emergency department with emergencies related to altered blood glucose level. **Material And Methods** The present study was conducted on patients presenting at the emergency medicine department of a tertiary care hospital in Ahmedabad with patients of acute emergencies related to altered blood glucose levels during 1st January 2019 to 31st December 2021. Clinical profile ,demographic profile and data regarding management of patient extracted from case record form were analyzed by SPSS 26 software. **Results** In present study most common emergency related to altered blood glucose level was hypoglycemia (50%), followed by DKA (48.59%), and HHS (1.40%).DKA was more common in patients of type 1 diabetes mellitus(47%) as compared to patients with type 2 diabetes mellitus. In patients with type 2, DM hypoglycemia was more common than in patients with type 2 DM(67.60%). we have not included cases that presented with diabetic autonomic dysfunction or other micro and/or macrovascular complications. **Conclusion** Hypoglycemia is most common emergency related to altered blood glucose level in diabetic patients presenting to emergency department. DKA is more common in type 1 dm(47%) as compared to type 2 DM and hypoglycemia is more common in type 2 DM(67.60%) as compared to type 1 DM(32.39%)

KEYWORDS

INTRODUCTION

DKA

Diabetic ketoacidosis (DKA) is an acute, major, life-threatening complication of diabetes that mainly occurs in patients with type 1 diabetes, but it is not uncommon in some patients with type 2 diabetes. DKA is most serious hyperglycaemic emergency in patient with type 1 and type 2 DM and associated with significant morbidity and mortality.(4)It is conceptualised that DKA occurs most often in patients with type 1 diabetes but this is not true. DKA also reported in type 2 diabetes mellitus; however, it rarely occurs without a precipitating factor.(5,6,7)Diabetes crises syndrome (DCS) or diabetic emergencies is an important contributor to ED hospitalizations especially in nations in socioeconomic and demographic transitions where there are limited options for standard diabetic care.(8,9,10) This condition is a complex metabolic state characterized by hyperglycemia, ketoacidosis and ketonuria. DKA consists of the triad of hyperglycemia, ketosis and acidemia. An arterial pH of less than 7.30, a serum bicarbonate value of less than 18 mEq/L, and blood glucose level of greater than 250 mg/dl with moderate degree of ketonemia [as determined by nitroprusside method] are necessary for the diagnosis of DKA."(11)

Hypoglycaemia

Hypoglycemia is one of the leading causes for Emergency Department (ED) visits and is the most common and easily preventable endocrine emergency. It is defined as a blood glucose of less than 54 mg/dl with neuroglycopenic symptoms or less than 40 mg/dl in the absence of symptoms.(12). Severe hypoglycaemia - that requires the assistance of another person is a clinical red flag. 12 Hypoglycemia remains the most common and serious iatrogenic cause of morbidity in diabetic patients."(13) For an emergency physician hypoglycaemia is of greater concern than hyperglycaemia as it can cause death. In diabetic patients it has been implicated as a cause of death in "dead- in- bed" syndrome and chronic cognitive impairment.(14)

As 14 prolonged duration of hypoglycemia may lead to significant morbidity and even mortality, each hypoglycemic episode should be addressed accurately in the aspects of etiological diagnosis and preventive measures. Mild hypoglycemia is characterized by unpleasant autonomic and neuroglycopenic symptoms.(15) Severe hypoglycaemia is usually defined as an episode requiring the assistance of another individual for recovery.(16) Causes include drugs, endocrine disorders, malignancies, malnutrition, and renal insufficiency, etc., However, Hypoglycemic agents used in DM are the most common cause of hypoglycemia(17)

HHS

The hyperosmolar hyperglycemic state (HHS) is the most serious acute hyperglycemic emergency in patients with type 2 diabetes. Von Frerichs and Dreschfeld described the first cases of HHS in the 1880s in patients with an "unusual diabetic coma" characterized by severe hyperglycemia and glycosuria in the absence of Kussmaul breathing, with a fruity breath odour or positive acetone test in the urine. The HHS is a syndrome characterized by severe hyperglycemia, hyperosmolality, and dehydration in the absence of ketoacidosis. Current diagnostic HHS criteria include a plasma glucose level >600 mg/dL and increased effective plasma osmolality >320 mOsm/kg in the absence of ketoacidosis.

MATERIAL AND METHODS

The present study was conducted on patients presenting at the emergency medicine department of a tertiary care hospital in Ahmedabad with patients of acute emergencies related to altered blood glucose levels during 1st January 2019 to 31st December 2021.The study was cross-sectional ,descriptive and total 142 cases was taken for study..

Sampling Method

We used a time sliced sample cases of diabetic emergencies (Hypoglycemia, DKA and HHS) which were admitted during the study period and met the below mentioned criteria were included in this study.

Inclusion Criteria
Age more than 15 years

Patients who met the case definition based outlined below

Exclusion Criteria
Suspected or confirmed history of poisoning with salicylate, ethylene glycol, paraldehyde, methanol, isopropanol, or propylene glycol.

Pregnant females.

Patients who presented with microvascular or macrovascular complication of Diabetes mellitus.

Patients admitted with acute diabetic emergencies (DKA, HYPOGLYCAEMIA, HHS) who themselves or their relatives (when patient was not in a condition to give voluntary informed consent) did not give consent to participate in the study.

Case Definition Of Dka
Adults with history, examination findings and laboratory criteria set by the American Diabetes Association and outlined below (American Diabetes Association. 2003; Kitachbi, Umpierrezz & Kreisberg 2006):

Subjective evidence based on symptoms and signs of DKA
A variable history of polyuria, polydipsia, weight loss, vomiting, abdominal pain, dehydration, weakness, mental status change and coma. Physical examination. findings that may include poor skin turgor, Kussmaul respiration, tachycardia, hypotension, alteration in mental status, coma, shock, emesis (including coffee-ground vomit), abdominal pain.

Objective evidence of DKA based on laboratory diagnostic criteria"(11)
Blood glucose >250mg/dl.

Acidosis demonstrated by or more of the following: 2.

Ph< 7.3

HCO, <18 mEq/L

High anion gap >12mliq/L..

Case Definition Of Hypoglycemia
The clinical syndrome of hypoglycemia is most commonly documented by Whipple's triad
1. Symptoms consistent with hypoglycemia A low plasma glucose concentration,
2. A LOW PLASMA GLUCOSE CONCENTRATION
3. Relief of those symptoms when the plasma glucose concentration is raised.

Subjective evidence-based signs and symptoms of hypoglycemia: -
The variable clinical features of behavioral changes, confusion, fatigue, loss of consciousness, palpitations, tremors, anxiety, sweating, diaphoresis, pallor, heart rate and systolic blood pressure are typically increased but may not be increased in individual who has experienced repeated episodes of hypoglycemia.

Objective evidence based of hypoglycemia based on laboratory criteria
A blood glucose of less than 54 mg/dl with neuroglycopenic symptoms or less than 40 mg/dl in the absence of symptoms.

Case Definition Of HHS
Subjective evidence-based signs and symptoms of HHS: - The patient with HHS is an elderly individual with type 2 DM, with a several- week history of polyuria, weight loss, and diminished oral intake that culminates in mental confusion, lethargy, or coma.

The physical examination reflects profound dehydration and hyperosmolality and reveals hypotension, tachycardia, and altered mental status. Absent of nausea, vomiting, abdominal pain and the Kussmaul respiration which is characteristic of DKA.

Objective evidence based on laboratory criteria-
Current diagnostic criteria include-
1. Blood glucose >600 mg/dl
2. Plasma osmolality >320 mOsm/kg
3. Absence of ketoacidosis.

Tools For Data Collection:
Data was collected using a pre-designed, semi structured and pretested schedule.

Data Collection:
Relatives of patients which met the inclusion criteria were approached and explained about the purpose of the study. They were assumed that this study will not interfere with the regular health services provided the patient. If they agreed, a written consent was obtained from them. In case the patient was in a condition to give voluntary informed written consent, the same was obtained from him or her. After obtaining the oral consent, the study tool or the schedule was filled in utilizing the patient records, case sheet and investigation reports. When needed, information was also obtained from patient's relatives or the patient himself.

Data Analysis:
Data entry and analysis were done using the Statistical Package for Social Sciences (SPSS) for Windows software (version 26; SPSS Inc, Chicago). Appropriate graphical tools were used to represent the data.

Observation
Type And Age Wise Distribution Of Patient Of Diabetes

AGE GROUP (YEARS)	TYPE 1 DM	TYPE 2 DM	TOTAL
15-20	18	00	18
21-30	26	00	26
31-40	05	20	25
41-50	04	20	24
51-60	01	19	20
>60	00	29	29
TOTAL	54	88	142

AGE GROUP	DM					
	1			2		
	M	F	T	M	F	T
	33	21	54	55	33	88

Diabetic Emergency

DIABETIC EMERGENCY	DM					
	TYPE1			TYPE2		
	M	F	TOTAL	M	F	TOTAL
HYPOGLYCEMIA	13	10	23	25	23	48
DKA	20	11	31	29	9	38
HHS	00	00	00	1	1	02
TOTAL	33	21	54	55	33	88

MEAN AGE		49.18 YEAR
GENDER RATIO		2.45
PRECIPITATING FACTOR		Percentage%
infection	33	42.82
Poor patient compliance	26	37.68
Unknown cause	3	4.34
First time presentation	7	10.14
PRESENTING FEATURE	NO OF DKA PATIENT	PERCENTAGE%
Nausea vomiting	35	50.72
Thirst dehydration	25	36.23
Abdominal pain	20	28.98
Kussmaul breathing	20	28.98
SEVERITY OF DKA	NO OF DKA PATIENT	PERCENTAGE%
Mild	17	24.63
moderate	33	47.82
Severe	19	27.53
AIRWAY MANAGEMENT	INVASIVE VENTILATION	NON INVASIVE VENTILATION
mild	00	00
moderate	00	9
Severe	10	5
OUTCOME	NO OF DKA PATIENT	PERCENTAGE%
Recovery	63	91.30
Death	6	8.70

Hypoglycemia
in our study the majority of patient were seen >60 years (32.39).mean age was 49.16 in our study total out of hypoglycemic patient .type 2 dm patient were 48 and type 1 dm were 23 patient.

GENDER	DM					
	TYPE1			TYPE2		
	M	F	T	M	F	T
	13	10	23	25	23	48

Hypoglycemia Was More Common In Male

MEAN AGE		49.16 YEARS
MEDICATION CAUSING HYPO	NO OF PATIENT	PERCENTAGE %
INSULIN	23	32.39
OHA	26	36.61
INSULIN+OHA	22	30.98
PRECIPITATING CAUSE	NO OF PATIENT	PERCENTAGE %
TAKING TOO MUCH OF INISULIN	12	16.9
EXCESS DOSE OF OHA	8	11.26
NOT EATING ENOUGH	6	8.45
SKIPPING MEALS	33	46.47
ALCOHOL INTAKE	4	5.63
DECRESED INSULIN REQUIREMENT	8	11.26
SYMTOMS	NO OF PATIENT	PERCENTAGE %
SWEATING	53	74.6
TREMORS	42	59.15
PALPITATION	39	54.92
VISUAL DISTURBANCE	19	26.76
SPEECH DEFICIENCY	36	50.7
ALTERED SENSORIUM	26	36.61
MORTALITY	0	

in our study all patient recovered after treatment without any residual neurological deficits

HHS
in our study 2 patient of hhs were observed,both are elderely diabetic patient , all 2 patient were of type 2 dm patients.

In our study total 2 patient of HHS , among which patients one was male and one was female. male to female ratio was 1:1 Both patient were presented with neurological manifestation in form of coma

Disposition Of Total Patient

DISPOSITION	NO. OF PATIENT
TRANSFER TO MEDICNE UNIT	50
SHIFTED TO ICU	90(7 DIED)
DAMA	2

DISCUSSION

Type And Age Wise Distribution Of Patients Of Diabetes
In our study type 2 DM were more common than type 1 DM. In a study by George et al.(18) reported that type 2 DM was more common than type 1 DM. In a study by Seth P et al(19)., Jabbar et al(20)., and Chaudhary et al.(21) also reported that type 2 DM was more common than type 1 DM.

In our study, the maximum number of patients with type 1 DM was seen in the 21-30 years age group, in this age group 26 patients were observed. While, in patients with type 2 DM, the maximum number of patients seen in >60 years of age.

In a study by Seth et al. reported that a maximum number of type 1 DM patients were observed in the young age group. While a maximum number of patients were observed in type 2 DM elderly patients >60 years of age.

However, a study by Barski et al(22). reported type 1 DM was more common than type 2 DM.

Gender-wise Distribution Of Patients Of Diabetes
In our study male population were more than female population and male to female ratio was 1.6:1 which is comparable to study by Bedaso et al(23)in which male to female ratio was 1.7:1.

In a study by Pankaj sheth et al(19). reported male to female ratio 1.3:1.

Diabetic Emergencies In Type 1 Dm
In our study DKA was more commonly seen in type 1 DM patients. In a study by Bedaso et al(23) DKA was more commonly reported in type 1 DM patients.

Diabetic Emergencies In Type 2 Dm
In our study hypoglycemia reported commonly in patients with type 2 DM. In a study by Mukharjee et al(24) also reported hypoglycemia was common in type 2 DM patients

SUMMARY AND CONCLUSION

We have studied patients presented in ED with Diabetic emergencies. However, we have not included cases who presented with diabetic autonomic dysfunction or other micro and/or macrovascular complications.

In our study total 142 patients were included, among these patients type 1 diabetes mellitus were 54 and type 2 diabetes mellitus were 88.

In our study DKA was more common in patients of type 1 diabetes mellitus as compared to patients with type 2 diabetes mellitus.

In patients with type 2 DM hypoglycemia was more common than patients with type 1 DM.

In our study most common acute diabetic emergency was hypoglycemia (50%), followed by DKA (48.59%), and HHS (1.40%)

DKA
In our study most common presenting feature of DKA was nausea /vomiting (50.72%) and second most common was thirst and dehydration (36.23%).

Most common precipitating factors of DKA was infection (42.82%) and second common precipitating factors was poor patient compliance (37.68%) The incidence of DKA was higher among the patients who were having high HbA1c level. In our study mortality rate of DKA was 8.69%.

Hypoglycemia
In our study majority of patients presented with hypoglycemia were >60 years old (32.39%).

Hypoglycemia was more common in male (53.52%) than female (46.48%). Glycemic range in cases presented with symptomatic hypoglycemia was 31-40(56.33%).

In our study most common precipitating factors was skipping meals (46.47%). Most common symptoms of hypoglycemia was sweating (74.64%) followed by tremors (59.15%) and palpitation in (54.92%).

In our study none of the patients presented with hypoglycemia had clinical stroke or seizures.

In our study all patients with hypoglycemia recovered without any residual neurological deficits.

HHS
In our study total 2 patients presented with HHS, of which one was male and one was female.

Most common presenting symptom was coma in both the patients.

Both patients were elderly type 2 DM of which female died and the male recovered.

CONCLUSION

Hypoglycemia, DKA and HHS are the commonest diabetic emergency which presents in ED, Hence ED physician should always have higher index of suspicions to clinch the diagnosis at earliest. He should suspect the above studied complications in diabetic patients and should be prepared to treat them in time as per laid down guidelines. Blood sugar and ABGA should be available in ED (point of care) to

expedite the diagnosis.

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