Original Article

Clinical Profile and Out Come of Diabetic Keto Acidosis in Emergency Department

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ABSTRACT

Objective: To ascertain the frequencies of presentations, biochemical profile compliance, comorbidities and outcomes of DKA, HHS and hypoglycemia.

Study Design: cross-sectional study

Place and Duration of Study: This study was conducted at emergency department of Ayub Teaching Hospital Abbottabad from June 2018 to December 2018.

Materials and Methods: All DKA, HHS and hypoglycemic patients presented in emergency department are included in study. We recorded demographic variables, clinical characteristics, chief complaints, comorbidities, hospital stay and outcome of complications. Anthropometric measures include pulse, blood pressure, respiratory rate, SPO2, GCS and temperature

Results: 197 diabetic patients were included in study. The mean age of sample was 53±18.84. 90/197 (45%) diabetic diagnosed individuals fulfilled HHS criteria. 57/197 patients (28%) met criteria of DKA, and 50/197 patients (25%) had hypoglycemia on presentation. The most common presentation of HHS and hypoglycemia was altered conscious level while majority of DKA were received in shock at presentation. The mean RBS of HHS, DKA, and hypoglycemic patients was 986mg/dl, 453mg/dl and 70mg/dl respectively. Glycosylated hemoglobin of HHS, DKA and hypoglycemia was 9.9, 9.4 and 6.5millimole respectively. 26 HHS patients died during management, 59 had comorbidities and common comorbidity was cardiovascular diseases (27%). 7 DKA patients died during management, 15 had underlying comorbidities. Renal comorbidities were commonly recorded. 2 hypoglycemic patients died during management, 28 had comorbidity and renal comorbidity was common. 81 HHS patients had poor compliance, 36 DKA had poor compliance and 19 hypoglycemics were poorly compliant to medications.

Conclusion: Highest mortality was recorded in HHS patients which is likely due to old age, cardiovascular comorbidities and poor compliance.

Key Words: Hypoglycemia, hyperosmolar hyperglycemic state (HHS), emergency department (ED), diabetic ketoacidosis (DKA), comorbidity, compliance

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INTRODUCTION

Diabetes is a chronic lifelong disease with which patient have to live. Diabetic patients frequently present with micro-vascular and macro-vascular complications. Among 26.3% of known diabetic Pakistani population, 19.2% are diagnosed and 7.1% are newly diagnosed.[1]

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Fatalities of acute complications, in elder diabetic population (age>50) are 40% while, 3% in younger individuals[2]. DKA with 3% annual increase in global incidence rate since 1980s is most common disease in children[3]. Patients with diabetic ketoacidosis classically present with triad of metabolic acidosis, hyperglycemia and hyperketonemia. With increase in prevalence of type 2 diabetes, DKA is not uncommon in type 2 diabetes mellitus (NIDDM) patients[4 10 9].

Hyperglycemic hyperosmolar state is altered mental status caused by hyperosmolarity, profound dehydration and severe hyperglycemia without significant ketosis[5]. Intensively treated (3-fold) diabetic patients who are on triple therapy and insulin respectively, have increased risk of hypoglycemia the most feared complication[6]. Severe hypoglycemia prolongs hospital stay of diabetic patient with increase prevalence of dementia[7]. Diabetic patients requiring emergency care for hypoglycemia have risks for long term mortality[8].

In Pakistan, people having little access to primary health care facility are presented to emergency department for diabetes related illness. Moreover, poor compliance to medication made frequent presentation to emergency department with complications[9]. Higher rate of non-compliance to medication among diabetic patients is noted in studies[4,6]. About 5 million deaths occur annually due to diabetes related complications in developing countries. As Pakistan is developing country its 28.3% urban and 25.3% rural population are diabetic[1]. So, emergencies regarding diabetes remain an important clinical problem among inhabitants of Pakistan. Surprisingly very little studies are conducted regarding clinical presentations, complication´s frequency, patient´s compliance, underlying diseases, outcomes and mortality in diabetic population.

MATERIALS AND METHODS

This cross-sectional study was undertaken at Ayub Teaching Hospital, a tertiary care hospital in Abbottabad, from 1st June 2018 to 31st December 2018. In these review demographic variable, clinical presentations, anthropometric measures and blood chemistry were recorded.

Anthropometric Measures: Patient was quickly evaluated by accessing blood pressure, respiratory rate, axillary temperature, Glasgow coma scale and oxygen saturation.

Chemistry: Include random blood sugar, fasting blood sugar, arterial blood gases, serum electrolytes, blood urea, blood creatinine and urine routine examination with ketones.

Patients diagnosed and labeled by clinicians as DKA, HHS and hypoglycemia were included in study. Data has been analyzed in IBM SPSS Statistics V.21. The level of statistical significance was set at 5%.

RESULTS

In 7-month study 200 people were selected but 3 refused to give consent (n=197). [90(45%) were male, 107(54%) were female] from the emergency department (ED) of Ayub Teaching Hospital.

Mean age of sample was 53±18.84 (age range 14-98 years). The most common emergencies encountered overall in diabetic population were: Ninety patients presented with HHS (45%), fifty-seven presented with DKA (28%), fifty presented with hypoglycemic emergencies (25%).

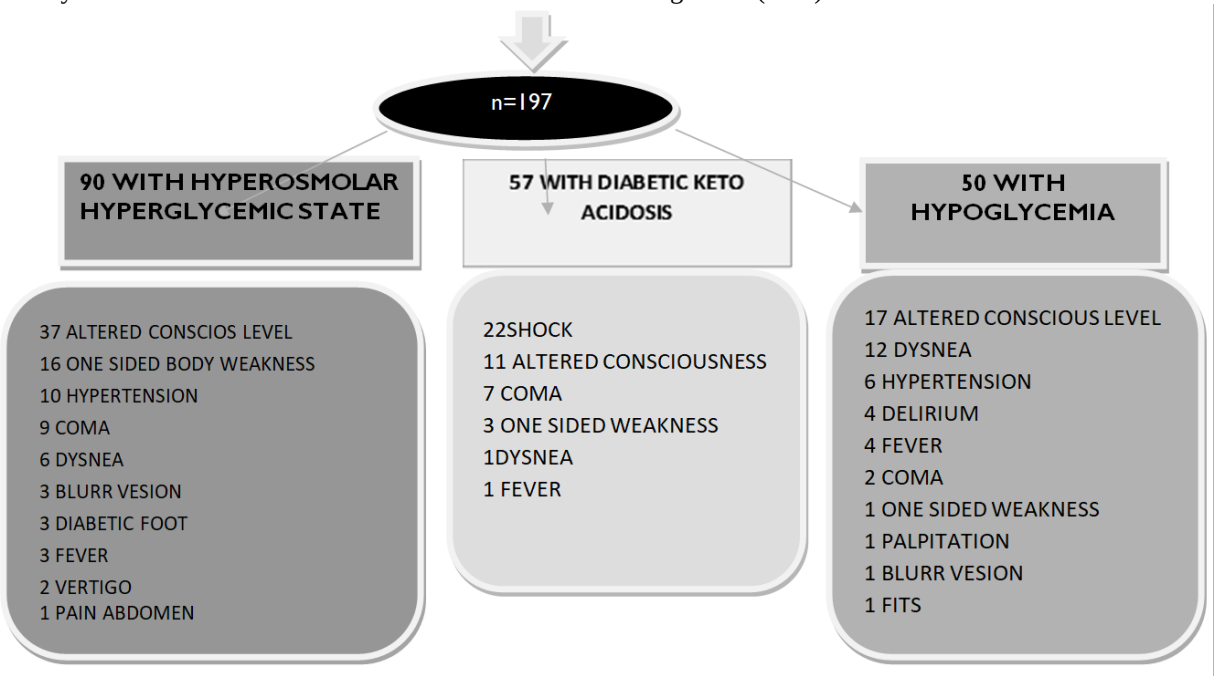

Figure No.1: Frequency of Diabetic Glycemic Emergencies encountedred in Emergency Department

Table No.1: Group statistics of diabetic patients presented in emergency

Variables		HHS (n=90)	Sig	**DKA** (n=57)	Sig	**Hypoglycemia** (n=50)	Sig
Diabetes	Type1	0	0.000	36	0.000	3	0.003
	Type2	90		21		47	
Urinary Ketone	+4	0	0.000	6	0.000	4	0.000
	+3	5		46		0	
	+2	5		5		3	
	0	80		0		43	

Urinary Glucose	+4		2		0.000	10		0.000	0		0.000
	+3		78			46			6		
	+2		8			1			5		
	0		2			0			39		
Arterial Blood Gases	Metabolic acidosis		28		0.005	53		0.000	6		0.005
	Normal		62			3			41		
	Missed		0			1			3		
Serum Sodium	>145		1		0.521	1		0.19	0		0.009
	<135		22			18			4		
	135-145		66			38			46		
Serum Potassium	>5		19		0.273	25		0.000	5		0.012
	<3.5		2			4			1		
	3.5-5		68			28			44		
Medication Used	Insulin		2		0.000	22		0.000	4		0.002
	Oral		82			16			45		
	Both		4			6			1		
	Not used		2			13			0		
Compliance	Poor		81			36		0.000	19		
	Good		7			4			31		
	Newly diagnosed		2			17			0		
Comorbidities	No		31		0.001	52		0.513	22		0.000
	Yes	Renal	59	14		15	7		28	20	
		Cardiac		25			4			7	
		CVA		16			3			0	
		Chronic pulmonary diseases		1			1			0	
		Liver Disease		3			0			1	
Outcome	Improved		64			50		0.15	48		
	Died		26			7			2		

DISCUSSION

To our knowledge this is first national study which is reporting frequency of diabetic presentations in emergency department. Also there is no recent data available on frequency of diabetic presentations internationally.

In present study, mean age was 53±18. This is older than National Diabetic Survey of Pakistan (NDSP) according to which mean age is 43±14[1]. This is probably due to large sample size of NDSP. The first most emergency encountered was HHS 90/200(45%), DKA 57/200(28.5%) and with hypoglycemia 50(25%). Remaining 3 patients did not fulfilled criteria of HHS, DKA and hypoglycemia.

The two common presentations of HHS were altered conscious level[7] 37/90(41%) followed by body weakness 16/90(17%). An old American study states weakness as a most common presentation (21/22) and altered conscious state the second common presentation (13/22) Khardori R et al [13]. This might be due to small sample size of American study. The mean age of HHS patients was 61±13 in contrast to American study which had age of 68.5±3.9. Other studies Macisacc et al [14] reports 69±1.7 which is also older than our HHS patients. Random blood sugar of present study HHS patients was 986mg/dl±84 which is almost consistent with macisacc et al and Kitabchi et al [15]. 90% HHS patients have normal ketone in urine. Kitabchi et al reports that HHS patients have low ketone level (β hydroxy butarate) 1.02 as compared to high 9.4 in DKA. 26/90 HHS patients died with mortality of 28%, this is very high as compared to macisacc et al which reports 17%. This can be explained by higher rate of underlying comorbidity. 59/90 had comorbidity, the common comorbidity was cardiovascular disease. Also the high mean blood pressure (143/93) was noted in HSS patients and the glycemic control of HHS patients was poor. The mean Hb1ac level was 9.9±2. Compliance in HHS patients was poor. Only 10% had good compliance. Higher rate of cardiac comorbidity, poor glycemic control and poor compliance can be the causes of high mortality in HSS patients.

Second most common emergency encountered was DKA. Majority of patients presented in shock 22/57(38%), followed by altered conscious level 11/57(19%) and 7/57(12%) in coma. Dehydration and altered mental status in DKA were also highlighted on

physical examination by study published in US [7]. A study done at Taiwan report nausea/vomiting the most common manifestation followed by drowsiness, dyspnea, polyurea and abdominal pain sue-Fu Lin et at[17]. The mean age at onset of DKA was 35±17 years in our study while most of DKA patients in Sue-Fu Lin, et al[17] was >40 years. In present study mean age of DKA is almost consistent with mean age in Macisacc et al[14] that is 33 years. Another Pakistani study reports mean age of DKA was 48±7 years A Jabbar et al[16]. 36/57(63%) DKA patients were type 1 diabetics and 22/57(38%) were type 2 diabetics[15]. 53/57(92%) DKA had metabolic acidosis consistent with Macisacc et al[14] (PH=7.1) and A Jabbar et al (PH=7.07). Random blood sugar of our study was 453mg/dl a little lower than Macisacc et al (RBS=504mg/dl) and A. Jabbar et al[16] (RBS=628mg/dl). Potassium level of DKA patients in present study was 43% hyperkalemic and 49% normokalaemia while A. Jabbar et al have mean value of potassium 4.9. In our study 100% DKA patients were urinary ketone positive, consistent with Kitabchi et al[15] which have ketone level of 9.1 (β hydroxybutyrate). During management of DKA patients, 7 patients died having mortality of 12% which is quite lower than reported by A. Jabbar et al. 36/57(63%) DKA patients had poor compliance, which was also found to be precipitating factor for DKA in 59% cases[10]. 15/57(26%) patients had underlying comorbidity. Renal comorbidity was prevalent in DKA patients.

17(29%) DKA patients were newly diagnosed type 1 diabetics, Sohail Bashir Sulehria et al [10] reports 23% newly diagnosed DKA while 2 HHS patients were newly diagnosed type 2 diabetics. As type 1 have more genetic pattern, increased incidence of type 1 can be due to intermarriages between cousins in Pakistani culture.

Hypoglycemia was third emergency 50/200 that was encountered in emergency department. Mostly hypoglycemic patients manifest in emergency with altered conscious level 17/50 followed by dyspnea 12/50, hypertension 6/50. This is not matched with Rajendran. R et al[8] which report unconscious (collapse) common hypoglycemic manifestation followed by confusion. Mean age of hypoglycemic patients was 58±15 which is younger than Rajendran R et al, this can be due to small size of our sample. 45/50(90%) hypoglycemic patients use oral hypoglycemic agent, Rajendran R et al states one third hypoglycemia is due to oral sulfonylureas, while Deusenberry CM et al [18] establish that hypoglycemia is common with oral hypoglycemics. 31/50 hypoglycemic patients had good compliance. 56% have comorbidity, it is depicted that renal comorbidity is prevalent in hypoglycemic patients [8,18], during management 48 improved and 2 died with mortality of 4%.

To the best of author's knowledge, literature is deficient regarding frequencies of diabetic patients with acute glycemic emergencies in Pakistan. So, results were mostly compared with studies of other countries. This study is important in two ways first for treating physician regarding different frequency figures of diabetic emergencies as a whole and then in various disease groups, secondly this study should serve as basis for future research in management and prevention of diabetic emergencies. At this point it is important to highlight that this is data from one journal tertiary care hospital. There is lot more to see in other hospitals which may also have adequate managements for complications, outcomes, mortalities etc.

CONCLUSION

Diabetes emergencies were predominant in female gender. HHS was most common emergency followed by DKA and hypoglycemia. HHS and hypoglycemia were prevalent in type 2 diabetes mellitus while DKA was prevalent in type 1 diabetes mellitus. Common presentation of HHS and hypoglycemia was altered conscious level while majority DKA manifest as shock. HHS patients were older than hypoglycemic and DKA patients. Type 2 diabetes was more prevalent in population while type 1 was prevalent in newly diagnosed diabetic patients. Overall compliance of the patients was very poor. Renal comorbidities were common in DKA and hypoglycemic patients while cardiovascular comorbidities were common in HHS patients. Highest mortality was recorded in HHS patients which t is likely due to old age, cardiovascular comorbidities and poor compliance.

Author's Contribution:

Concept & Design of Study:	Niama Khan
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Data Analysis:	Mohsin Khan, Faiza Khan
Revisiting Critically:	Haidar Zaman
Final Approval of version:	Niama Khan, Mudassir Abdul Jalil Qureshi

Conflict of Interest: The study has no conflict of interest to declare by any author.

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