Ecg Changes In Hypoglycemic Episode In Diabetic Patients And Its Association With Morbidity And Mortality

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Abstract

Background: Hypoglycemia is a cause of significant morbidity among patients with diabetes and may be associated with greater risk of death. Self-report of severe hypoglycemia is therefore an important prognostic indicator that should be included in the clinical assessment of each patient with diabetes.

Methods: A hospital based prospective observational study conducted on 80 patients presenting with acute hypoglycaemic episode (RBS < 70 mg/dl). ECG of all patients were recorded. Data were collected and analyzed by EPI-info software.

Results: out of 80 patients 2 patients died and out of 2 died patients 1patients show flat T-wave & short PR interval and both patients show ST depression & Increased QTc interval.

Conclusion: We concluded that various electrocardiographic findings were associated with hypoglycemia in DM patients, to name a few (ST segment and repolarization changes, T-wave flattening and inversion, QT interval prolongation, as well as sinus tachycardia and bradycardia, various degrees of atrioventricular block) found in various isolated case reports. Our study highlights the most common ECG finding as increased amplitude seen during hypoglycemia in Type 2 DM patients and patients with ST depression and increased QTc interval which was associated with poor prognosis. Awareness, diabetes education and the appropriate way of taking Oral hypoglycemic agents (OHA) can lead to reduction in number of hypoglycemic events and related signs. One drawback of our study was that more rural patients should have been included, more female patients should have been included in the study

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Introduction

Diabetes Mellitus (DM) is one of the most challenging public health problems in 21st century. There is an urgency for greater action to improve diabetes outcomes and reduce the global burden of diabetes now affecting more than 425 million people, of which one-third are people older than 65 years. The estimates of children and adolescents below age 19 with type 1 diabetes has risen to over a million. If nothing is done, the number of people with diabetes may rise to 693 million in 2045, although positively the incidence has started to drop in some high income countries.[1]

Hypoglycemia is a cause of significant morbidity among patients with diabetes and may be associated with greater risk of death. Hypoglycemia is common in patients with type 1 and type 2 diabetes, increasing in prevalence with disease duration and higher HbA1c. Patient-reported severe hypoglycemia is associated with 3.4-fold increase in 5-year mortality. [2] Self-report of severe hypoglycemia is therefore an important prognostic indicator that should be included in the clinical assessment of each patient with diabetes.

Material and methods

Type of Study: A hospital based prospective observational study

Period of Study: January 2020 to June 2021

Place of Study: Department of General Medicine, Mahatma Gandhi Medical College & Hospital, Jaipur

Institute Ethics Committee approval to be obtained before start of study.

Written and informed consent of the patients was obtained from all participants before enrolment into the study.

Selection of cases Patients presenting with hypoglycemia attending OPD

Sample Size: All patients of diabetes mellitus who present to the emergency department and attending OPD

Plan of Study

Inclusion Criteria

a) All patients presenting with acute hypoglycaemic episode (RBS < 70 mg/dl)

b) Age > 18 years

Exclusion Criteria

a) Patients with pre-existing cardiac disease including CAD, Arrythmias.

b) Patients presented with Acute Coronary events or Acute cerebrovascular events.

c) Patients with history of recent infections or having a comorbid condition predisposing to ECG Changes.

d) Patients with history of following arrhythmogenic drug intake.

Data collected was analysed by frequency, percentage, mean, standard deviation (S. D). Appropriate statistical tests were used to find significant association. P Value < 0.05 was considered statistically significant.

Results

Table 1: Socio-demographic profile

Mean age	55.91±10.88 Yrs
Male : Female	5 : 3
Family history	7(8.75%)
Mean duration of DM	20.65±3.11 Yrs
Mortality	2 (2.50%)

Mean age was 55.91±10.88 Yrs. 62.50% patients were male and 37.50% patients were female. 8.75% patients family history regarding DM present. Mean duration of DM was 20.65±3.11 Yrs. Most common symptom was syncope(85.00%), fatigue(71.25%), weakness(71.25%), palpitation (70.00%), diaphoresis(66.25%),

irritability(55.00%) and Syncope(5.00%) & seizures(5.00%).2.50% patients were died

Table 2: ECG Finding wise distribution of study subjects

ECG finding		No of cases	Percentage
T-wave	Flat	48	60.00
	Normal	17	21.25
	Slight prolonged	15	18.75
QTc interval	Normal	18	35.00
	Increased	52	65.00
Amplitude	Normal	20	25.00
	Increased	60	75.00
P-R interval	Short	16	20.00
	Normal	64	80.00
ST segment	Depression	20	25.00
	Normal	60	75.00

In our study, most common ECG finding was increased amplitude seen 75.00% patients, increased QTc interval seen in 65.00% patients, flat T-wave seen in 60.00% patients, ST segment depression seen in 25.00% patients and PR interval short seen in 20.00% patients.

Table 3: Association between ECG Finding and mortality

ECG finding		Total no of cases	Outcome	
			Mortality	Survived
T-wave	Flat	48	1	47
	Normal	17	0	17
	Slight prolonged	15	1	14
QTc interval	Normal	18	0	18
	Increased	52	2	50
Amplitude	Normal	20	0	20
	Increased	60	2	58
P-R	Short	16	1	15
interval	Normal	64	1	63
ST segment	Depression	20	2	18
	Normal	60	0	60

In our study, out of 80 patients 2 patients died and out of 2 died patients 1patients show flat T-wave & short PR interval and both patients show ST depression & Increased QTc interval.

Discussion

Most common ECG finding was increased amplitude seen 75.00% patients, increased QTc interval seen in 65.00% patients, flat T- wave seen in 60.00% patients,ST segment depression seen in 25.00% patients and PR interval short seen in 20.00% patients in our study. It is well described that the features of the ECG changes during hypoglycemia.[3-6] These changes include a general slowing of the conduction, as quantified by prolonged QTc and prolonged TpTec. This relates directly to an apparent risk of hypoglycemia-related cardiac arrhythmia2 and may constitute a possible basis for a hypoglycemia alarm. In previous studies, a fair sensitivity and specificity has been achieved applying continuous and automated ECG analysis.[7] A potential shortcoming may be the fact that a number of other factors affect ECG features. These include drugs commonly used by diabetes patients such as many antihypertensive agents (angiotensin-convertingenzyme inhibitors and beta blocking agents)[8-9], drugs for congestive heart disease such as digoxine[10] (which reduces the QTc), and, importantly, also the hypoglycemia-associated autonomic failure per se (which includes reduced or abolished release of catecholamine).3This might be the reason that T1DM patient with late diabetes complications display less ECG changes at comparable glucose levels when compared with healthy subjects and T1DM patients without

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complications.[11] This is in line with our data showing that three out of nine patients who did not display ECG changes during hypoglycemia suffered from impaired awareness of hypoglycemia, although the small study size does not allow statistical conclusions to be made.

Conclusion

We concluded that various electrocardiographic findings were associated with hypoglycemia in DM patients, to name a few (ST segment and repolarization changes, T-wave flattening and inversion, QT interval prolongation, as well as sinus tachycardia and bradycardia, various degrees of atrioventricular block) found in various isolated case reports. Our study highlights the most common ECG finding as increased amplitude seen during hypoglycemia in Type 2 DM patients and patients with ST depression and increased QTc interval which was associated with poor prognosis. Awareness, diabetes education and the appropriate way of taking Oral hypoglycemic agents (OHA) can lead to reduction in number of hypoglycemic events and related signs. One drawback of our study was that more rural patients should have been included, more female patients should have been included in the study

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