



A Study of Clinical Profile of Hyperglycemic Seizures in a Tertiary Care Hospital

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Introduction

Seizures associated with Non Ketotic Hyperglycemia is now more commonly recognized new entity

Among adults in our area. Hyperglycemic Seizure– a special Neuroendocrine syndrome most commonly due to Non Ketotic Hyperglycemia has got its unique way of presentation, the clinical recognition of this entity was first made by MACCAIRO in 1965.¹⁴ the seizures may be the initial manifestation of Diabetes Mellitus. In the recent years clinical and experimental studies in animals, apart from routine investigations, CT Scan Brain, EEG and SPECT Scan were done to evaluate this entity. The clinical presentation of hyperglycemic seizures associated with Non Ketotic Hyperglycemia is studied only by few authors. The real clinical picture needs further studies and evaluation and with this background, we evaluated clinical findings and investigations in all patients with hyperglycemic seizures.

Aims and Objectives

- 1) To study the clinical profile of Hyperglycemic Seizure (HGS).
- 2) To map out the age and sex incidence of Hyperglycemic Seizure (HGS)
- 3) To analyze the commonly occurring type of seizure in Hyperglycemic Seizure
- 4) To evaluate the blood sugar levels with which Hyperglycemic Seizure occurs.
- 5) To decide the level of serum osmolality with which commonly Hyperglycemic Seizure occurs.

Materials and Methods

Study Design: Hospital based prospective observational study from October 2017 to March 2019.

Study Setting: King George hospital, Andhra medical College, Visakhapatnam, Andhra Pradesh.

Sample Size: This is study included 60 patients diagnosed as Hyperglycemic Seizure on the basis of clinical evaluation Biochemical investigations

and CT scan Brain and Electro Encephalographic studies, who were admitted to the Medical wards including neurology and Intensive Medical care units.

Inclusion Criteria

- Patients taken for this study includes Patients admitted with first time convulsions who was later found to be Diabetic and whose first admission Blood Sugar was in Hyperglycemic level.
- Known Diabetic patients who had focal neurological symptoms / convulsions whose Blood sugar during convulsions showed Hyperglycemic Seizure level.
- Other Systemic problem patients who had convulsions during their hospital stay and showed Hyperglycemic level of Blood glucose and later who were diagnosed as Diabetic patients..

Exclusion Criteria

- All patients with Seizure disorder of varying etiology without Hyperglycemia
- Patients with Diabetes and Cerebo vascular accidents without convulsions

Serum Osmolality

$$= 2 \times [Na^+ + K^+] + \frac{\text{Blood Glucose in mgs}}{18} + \frac{\text{Blood Urea Nitrogen}^4}{2.8}$$

$$= 2 \times [Na^+ + K^+] + \frac{\text{Blood Glucose in mgs}}{18} + \frac{\text{Blood Urea in mgs}^7}{6}$$

Serum Osmolality Normal Range = 275 to 295 mosm / kg ⁶

1 mosm of Gulcose equals = 180mg/1 or 18mg/dl ⁴

Urea Nitrogen equals = 28mg/1 or 2.8 mg/dl ⁶

Age Distribution

Table – I

Sl. No.	Details	No. of Patients with Hyperglycemia seizure diagnosed	Percentage for Total Patients
1	Age < 19 Years	2	3.3%
2	Age 20 – 29 Years	2	3.3%
3	Age 30 – 39 Years	2	3.3%
4	Age 40 – 49 Years	12	20%
5	Age 50 – 59 Years	16	26.6%
6	Age > 60 Years	26	43.3%
	Total	60	100%

- Patients with previously known Structural Brain disorder with seizures or patients with convulsions following IV Glucose.

Procedure

Hyperglycemic Seizures was diagnosed on the basis of Diabetic patients who had Hyperglycemia with:^{5,13}

- 1) Abnormal involuntary Movements
- 2) Paroxysmal choreo athetosis
- 3) Focal Seizures
- 4) Generalized Tonic Clonic Seizure (GTCS).
- 5) Epilepsia partialis continua.

The detailed History and clinical examinations were done as outlined in the proforma and they were subjected to routine haematological, Biochemical investigations, CT scan evaluation including other systemic problem oriented evaluation. EEG studies were done in all patients.

Serum Osmolality

The serum Osmolality was calculated from the following formula:

Results

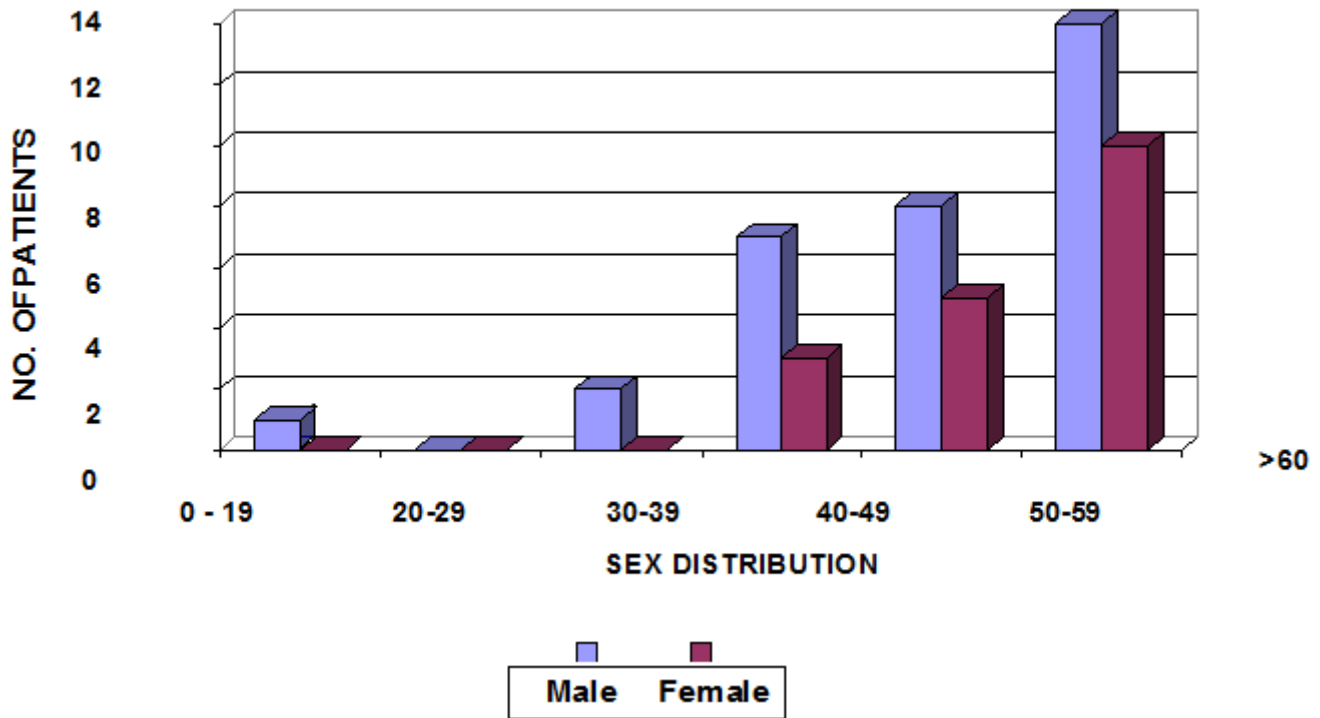
Results and Observation

The total number of patients in this study was 60. The study was done during the period from September 2017 to March 2019.

The total number of patients included in the study was 60. Out of which 2 patient belong to the age group of less than 20 years. The youngest of them was 18 years old. 2 patients belong to age group of 30 – 39 years. 12 patients belong to age group

of 40 – 49 years. 16 patients belong to age group of 50 – 59 years. 26 patients belong to age group of above 60 years. 42 patients were below the age of 50 years.

BAR DIAGRAM SHOWS THE SEX DISTRIBUTION



Out of 50 patients, 32 were male patients and 18 were female patients.

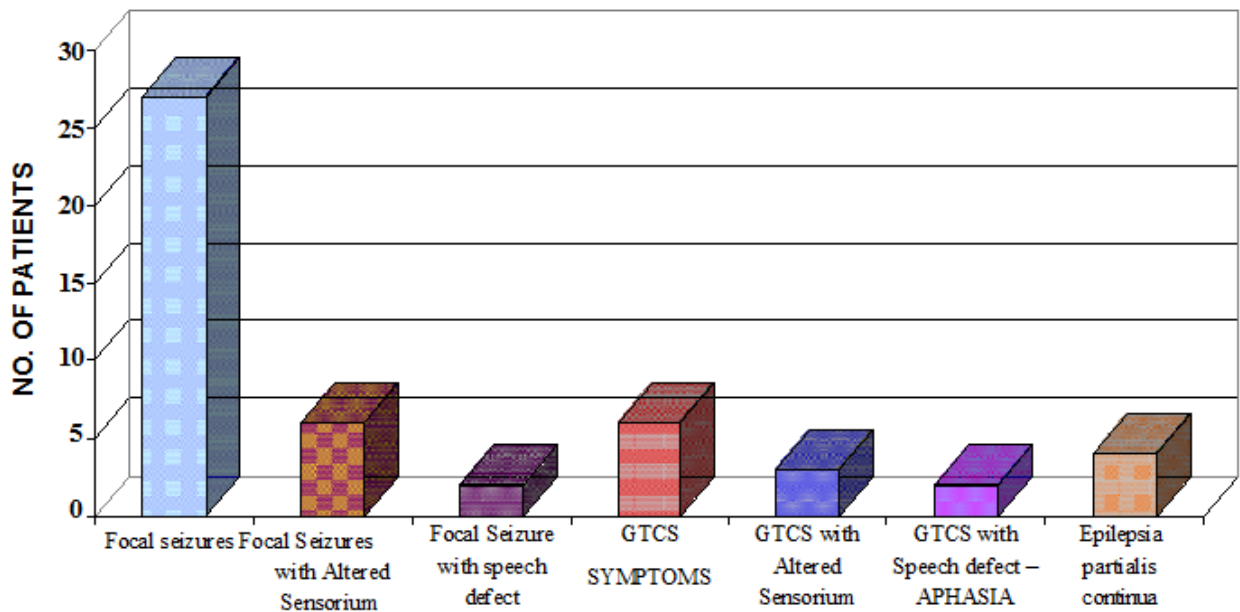
Admission Status

Sl. No.	Details	No. of Patient Out of 60 patients	Percentage for total patients
1	First time admission with seizures	33	55%
2	Diabetes Mellitus with seizures	27	45%

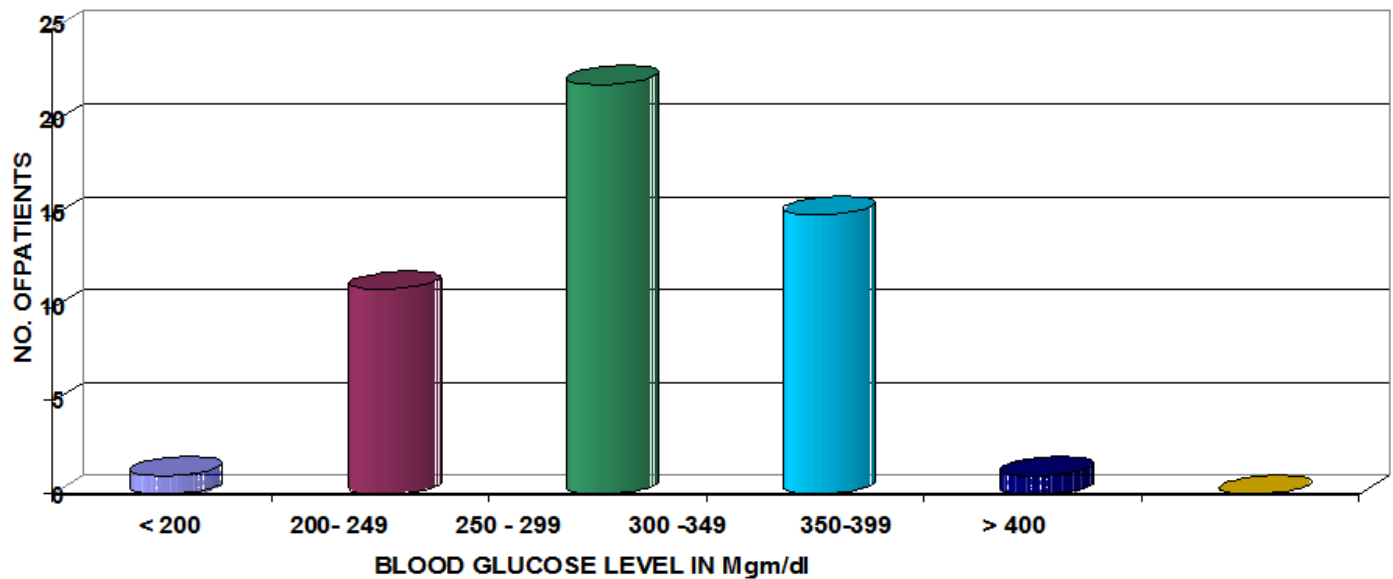
Out of 60 study patients, 33 patients had first time seizure without known Diabetes. 27 patients had diabetes with seizures

Out of 60 patients, 40 patients had focal seizure and 16 patients had generalized tonic clonic seizure, 4 patients had epilepsy partialis continua

ANALYSIS OF SYMPTOMS SIGN OF HYPERGLYCEMIA



Blood Glucose Analysis



Among the 60 cases, 2 patient had blood sugar < 200 mg/dl and 15 patients had blood sugar level was 200 -249 mg/dl. 25 patients had 250 – 299

mg/dl. 15 patients had 300 – 349 mg/dl. 2 patient had 350 – 399mg/dl. One of the patient had found blood glucose level above 400 mg/dl

Osmolality Analysis

Sl. No.	Serum Osmolality in m.osm/L	No. of Patients	Percentage for Total no. of Patients
1	Normal (275 – 295)	10	16.6%
2	Abnormal – above 295	50	83.3%
Total		60	-

Among 60 patients serum osmolality was normal in 10 patients. 50 patients had hyperosmolality.

Acetone Analysis

Among 50 patients, Plasma acetone and Urine acetone was positive in 1 patient.

EEG Analysis

Sl. No.	Details		No. of Patients	Percentage for Total No. of Patients
1	Normal		50	83.3%
2	Abnormal			
	a)	Bilateral epileptiform moves on right side	6	10%
	b)	Bilateral epileptiform moves on left side	2	3.3%
	c)	Intermittent spike and sharp waves discharge on left parietal leads	2	3.3%
Total			60	100%

Out of 60 study patients, 50 patients had normal EEG and 10 patients had abnormal EEG. In among 10 patients, 2 patients had intermittent spike and sharp waves discharge on left parietal leads, and 6 patients had bilateral epileptiform moves on right side and 2 patients had epileptiform moves on Left side.

Discussion

60 patients who presented with new onset seizure and hyperglycemia to King George hospital visakhapatnam were analyzed as follows:

Maccario et al has shown that seizures occurred as the first manifestation of Non Ketotic Hyperglycemia.

The occurrence of seizure as presenting features of Hyperglycemia with Non Ketotic Hyperglycemia was first emphasized by *Maccario et al.* in 1965.¹⁴

Age and Sex

In a study conducted by *Maccario et al* seizures occurred as the first manifestation of diabetes in patients above 60 years.

In our study 43% of patients had new onset seizures were above 60 years. They were found to have Non Ketotic Hyperglycemia

*Lammouchi T, Grira M, et al,*¹² studied 22 cases. 11 out of 22 cases diabetes mellitus had not been diagnosed previously. In our study 33 out of 60 cases were not diagnosed previously.

Seizure types in Hyperglycemia

In a study conducted by *Vargese K.S, et al,*⁹ Focal seizure with (or) without generalization occurred

in 65% of patients.

In our study Focal seizure without generalization occurred in 66% (40/60) case. Focal seizure with generalization occurred in 26% (16/60) case *Rector WG,*¹¹ Reviewed 158 cases, in his study 44% cases were focal seizure. 18% of cases were generalized seizures.

Epilepsia Partialis Continua

Epilepsia Partialis Continua is one of the early presentation of Non Ketotic Hyperglycemia.

In our study Epilepsia Partialis Continua occurred in 7% of patients.

*Singh BM et al,*¹⁵ studied 21 patients with seizures. He showed Epilepsia Partialis Continua occurred in 9 patients [9/21 □43%] with Non Ketotic Hyperglycemia.

*Lammouchi T, Grira M, et al,*¹² studied 22 patient with Non Ketotic Hyperglycemia. Out of which 14% presented with Epilepsia Partialis Continua in his study.

Blood Sugar

In our study, mean blood sugar was 277.3 mg / dl with the range of blood sugar was 191 – 398 mg/dl.

In two studies conducted by *Grant C, Charles Warlow, et al,*¹⁶ range of blood sugar was 234 mg / dl to 600 mg / dl among the patients with Non Ketotic Hyperglycemia.

In another study by *Scherer C,*⁸ observed that the mean blood sugar level was above 340 mg / dl in

patients presented with focal seizures and Non Ketotic Hyperglycemia.

In another study by, *Venna N, Sabin et al*, showed hyperglycemia is intrinsically epileptogenic and levels of blood glucose triggering seizures may be as low as 14 – 20 mmol /L (252 – 360 mg/dl).

The incidence of blood glucose level with which hyperglycemic seizures occurred in our study is comparatively less than their studies (191 – 398mg/dl).

*James C. Kolb*¹⁷, seizures hyperglycemia evaluate the frequency and type of seizure and glucose level of patient. Level of alertness he evaluated in 813 patients with blood glucose level above 400 mg and observed only 8 out of 813 patients (1%) had seizures with Non Ketotic Hyperglycemia. He concluded that focal or generalized seizure induced by hyperglycemia occurred in the absence of precipitating factors. This study also showed that seizures are rare with blood glucose more than 400 mg / dl. In our study patients with blood sugar value more than 400 mg had no seizures

Diabetic Keto Acidosis

Engel and Pedley studied, ketotic hyperglycemia is less frequently associated with seizure possibly because of the antiepileptic effect of ketosis.

A study by *J.J. Mc. Murray*¹⁰ observed that seizures are not seen in Diabetic ketosis because ketones have an antiepileptic effect.

Vargees KS, et al, studied 40 cases and observed none of the patients with Diabetic Ketoacidosis had seizures.

In our study 2% of patients with Diabetic Ketoacidosis had seizures.

Hyperosmolality

In our study, 85% of patients had increased osmolality with range between (295 – 330m.osm/l), 10 cases (16%) had serum osmolality in the normal range (275 – 295m.osm/l).

Vargese K.S, et al studied 40 patients with Seizure and hyperglycemia observed in 90 % of study group had increased serum osmolality.

Scherer C,⁸ observed seizure occurs if serum osmolality is normal or slightly elevated.

EEG

In our study, 10 out of 60 (16%) with hyperglycemic seizures had abnormal EEG.⁵

Conclusion

- Hyperglycemic Seizures is a special neuro–endocrine syndrome. Seizures can manifest as the first symptom of Diabetes Mellitus.
- Hyperglycemic seizures can occur in Ketotic and Non Ketotic Hyperglycemia but commonly in patients with non ketotic hyperglycemia. Hyperglycemic seizures is rarely associated with Diabetic Keto acidosis.
- Generalized tonic clonic seizure as the first manifestation of Non Ketotic hyperglycemia is found to be rare.
- Hyperglycemic seizures occurred commonly above the age of 50 years and the incidence is more in males.
- Most of the patients with hyperglycemic seizures had blood glucose value between 250 – 300 mg/dl.
- In our study the mean blood glucose value was 277.3 mg/dl among patients with hyperglycemic seizures.
- The minimum blood sugar value at which hyperglycemic seizure occurred was 191 mg/dl and maximum blood sugar value at which hyperglycemic seizures occurred was 398 mg/dl.
- The osmolality was above the normal range in the maximum of 90% of cases.
- EEG was normal in majority of patients with Non Ketotic hyperglycemic seizures.
- The correction of Non Ketotic hyperglycemia with insulin and IV fluids showed early and complete recovery.
- From the above study, it is shown that all patient with new onset seizures above the age of 50 years should also be thought of Diabetes Mellitus and evaluated for it.

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