

Original Research

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Clinical Profile of Hyperosmolar Hyperglycemic State among Patients Presenting with Uncontrolled Type II Diabetes Mellitus

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ABSTRACT:

Background: Hyperosmolar Hyperglycemic State (HHS) is a severe acute metabolic complication of diabetes mellitus characterized by marked hyperglycemia, hyperosmolarity and profound dehydration, with little or no ketosis. Early recognition and identification of precipitating factors are important in the clinical management of this emergency.

Aim: To assess the clinical profile of Hyperosmolar Hyperglycemic State in patients presenting with uncontrolled type II diabetes mellitus.

Methods: A cross-sectional study was conducted over 18 months in the Department of Casualty, General Medicine wards and ICU of Sree Balaji Medical College, Chennai. Patients with uncontrolled type 2 diabetes mellitus and clinical features suggestive of HHS were screened. Purposive sampling was used and 100 eligible patients were included. Demographic, clinical, comorbidity, precipitating-factor and biochemical data were recorded.

Results: The mean age was 54.31 ± 8.22 years and 70% were male. Mean BMI was 28.68 ± 1.71 kg/m²; 51% were in the 27.6–30.0 kg/m² category and 25% had BMI >30 kg/m². Sixty-three percent belonged to the lower income group. Pneumonia was reported in 45%, urinary tract infection in 28% and sepsis in 27%. Stroke, acute myocardial infarction and heart failure were reported in 56%, 27% and 17%, respectively. Mean blood glucose was 705.67 ± 67.33 mg/dL and mean serum osmolality was 505.23 ± 94.26 mOsm/kg. Clinical dehydration was present in 98% and altered mental status in 97%. Absence of ketosis was reported in all patients, with mean serum bicarbonate of 27.18 ± 5.15 mEq/L.

Conclusion: In this study population, HHS was characterized by severe hyperglycemia, hyperosmolarity, marked dehydration and frequent neurological manifestations. Infection, particularly pneumonia, was frequently reported, and cardiovascular and cerebrovascular events were also observed.

INTRODUCTION

Hyperosmolar Hyperglycemic State is a potentially life-threatening metabolic emergency occurring predominantly in patients with type 2 diabetes mellitus. It is characterized by severe hyperglycemia, increased serum osmolality and marked dehydration, with minimal or absent ketoacidosis. The dissertation describes HHS as an important acute complication of uncontrolled type 2 diabetes mellitus and emphasizes the role of precipitating illnesses such as infection and acute vascular events.

Severe hyperglycemia causes osmotic diuresis, resulting in substantial water and electrolyte losses and progressive hyperosmolarity. Neurological manifestations may occur with increasing hyperosmolarity and dehydration. Because the presentation may be gradual and nonspecific, recognition of the clinical and biochemical pattern is important.

The present study was undertaken to assess the demographic characteristics, clinical presentation, laboratory profile, precipitating factors, comorbidities and reported outcomes of patients with HHS in the setting of uncontrolled type 2 diabetes mellitus.

AIM AND OBJECTIVES

Aim: To assess the clinical profile of Hyperosmolar Hyperglycemic State in patients presenting with uncontrolled type II diabetes mellitus.

1. To assess the distribution of HHS in patients presenting with uncontrolled type II diabetes mellitus.
2. To assess various determinants associated with the hyperglycemic emergency state among the study population.
3. To assess laboratory parameters including fasting and postprandial blood glucose, HbA1c, serum osmolality, serum electrolytes, magnesium, phosphorus, ketones, arterial blood gas, renal function tests, serum enzymes, complete blood count and urine analysis inclusive of ketones.
4. To study the outcome of HHS among the study population.

MATERIALS AND METHODS

Study design and setting

This was a cross-sectional study conducted over 18 months in the Department of Casualty, General Medicine wards and ICU of Sree Balaji Medical College, a tertiary-care hospital in Chennai.

Study population and sampling

The study population comprised patients presenting with uncontrolled type 2 diabetes mellitus and clinical features suggestive of HHS. Purposive sampling was employed. The calculated minimum sample size was 89 and 100 patients were included.

Eligibility criteria

Patients with uncontrolled type 2 diabetes mellitus presenting with clinical features of HHS, including dehydration, altered mental status and lack of ketosis, and meeting the biochemical thresholds specified in the study protocol were included. Patients with diabetes insipidus-associated hyperglycemia, type 1 diabetes mellitus, hypernatremia, hyperammonemia, severe drug/alcohol intoxication or uremic encephalopathy were excluded.

Data collection

Clinical history, physical examination and laboratory investigations were recorded. Investigations included blood glucose, HbA1c, serum osmolality, electrolytes, magnesium, phosphorus, ketones, arterial blood gas, renal function tests, liver function tests, complete blood count and urine analysis.

Statistical analysis

The dissertation states that statistical analysis was performed using statistical software such as SPSS or R, with descriptive statistics and correlation analysis. For this manuscript, findings are presented primarily as frequencies, percentages, means and standard deviations as reported in the dissertation.

RESULTS

Demographic and anthropometric profile

Table 1. Demographic and anthropometric characteristics of the study population.

Variable	Finding
Number of patients	100
Mean age	54.31 $\pm$ 8.22 years
Male	70%
Female	30%
Married	89%
Secondary education	54%
Lower income group	63%

Mean BMI	28.68 ± 1.71 kg/m ²
BMI 27.6–30.0 kg/m ²	51%
BMI >30 kg/m ²	25%

Comorbidities

Table 2. Reported comorbidities in the study population.

Comorbidity	n (%)
Diabetes mellitus, complicated	38 (38%)
Diabetes mellitus, uncomplicated	19 (19%)
Cancer	10 (10%)
Cerebrovascular disease	9 (9%)
Dementia	9 (9%)
Alcohol use disorder	8 (8%)
Chronic renal disease	7 (7%)

Precipitating infections

Table 3. Reported infectious precipitating factors.

Infectious condition	n (%)
Pneumonia	45 (45%)
Urinary tract infection	28 (28%)
Sepsis	27 (27%)

Cardiovascular and cerebrovascular events

Table 4. Reported cardiovascular and cerebrovascular events.

Event	n (%)
Stroke	56 (56%)
Acute myocardial infarction	27 (27%)
Heart failure	17 (17%)

Biochemical and clinical profile

Table 5. Major clinical and biochemical findings.

Parameter	Finding
Mean blood glucose	705.67 ± 67.33 mg/dL
601–700 mg/dL	55%
701–800 mg/dL	39%
>800 mg/dL	6%
Mean serum osmolality	505.23 ± 94.26 mOsm/kg

Serum osmolality 451–600 mOsm/kg	62%
Mean serum bicarbonate	27.18 ± 5.15 mEq/L
Absence of ketosis	100%
Clinical dehydration	98%
Altered mental status	97%

DISCUSSION

The present study describes the clinical and biochemical profile of 100 patients with HHS and uncontrolled type 2 diabetes mellitus. The mean age was 54.31 years, and males constituted 70% of the study population. The dissertation notes that the observed age and sex distribution is broadly comparable with earlier reports cited in the thesis.

The mean BMI was 28.68 kg/m², and more than half of the patients were in the 27.6–30.0 kg/m² category. This finding indicates that overweight status was common in the study population. However, because the study was cross-sectional and did not include a comparison group, these findings should be described as an observed characteristic rather than evidence of an independent causal effect of BMI.

Infections were frequently reported, with pneumonia being the most common infectious condition, followed by urinary tract infection and sepsis. These findings are clinically relevant because acute infection and systemic illness can coexist with severe hyperglycemia and may contribute to presentation with hyperglycemic emergencies.

The biochemical profile demonstrated marked hyperglycemia and hyperosmolality. The mean blood glucose was 705.67 mg/dL and the mean serum osmolality was 505.23 mOsm/kg. Clinical dehydration was documented in 98% of patients, while altered mental status was documented in 97%. These findings are consistent with the clinical picture described in the dissertation.

The study reported absence of ketosis in all patients and a mean serum bicarbonate concentration of 27.18 mEq/L. These findings were used in the dissertation to distinguish the HHS profile from diabetic ketoacidosis.

Stroke, acute myocardial infarction and heart failure were also reported. The distribution should be interpreted as the frequency of these events in the study population as presented in the dissertation; the cross-sectional design does not establish whether an event caused HHS or occurred as a consequence of the hyperosmolar state.

LIMITATIONS

- The cross-sectional design limits assessment of temporal and causal relationships.
- The study was performed at a single tertiary-care centre, which may limit generalizability.
- The sample size was 100 patients and purposive sampling was used.
- No control group was included, so associations cannot be interpreted as independent risk factors.
- The dissertation reports several electrolyte results as coded values; their original clinical units should be verified before publication.
- The article focuses on the clinical and biochemical profile and should not claim independent predictors or causal determinants unless the corresponding inferential analyses are available.

CONCLUSION

In this cross-sectional study of 100 patients with uncontrolled type 2 diabetes mellitus and HHS, the predominant findings were severe hyperglycemia, marked hyperosmolality, profound dehydration and frequent altered mental status. The study population was predominantly middle-aged and male, with overweight status commonly observed. Pneumonia, urinary tract infection and sepsis were frequently reported precipitating infections, while stroke, acute myocardial infarction and heart failure were also documented. These findings support the importance of early recognition of HHS and systematic assessment for dehydration, neurological manifestations, infection and associated vascular disease.

DECLARATIONS

Ethics approval

Ethics approval was obtained as documented in the dissertation. The final journal submission should insert the exact Ethics Committee name and approval/reference number from the original ethics approval letter.

Consent for publication

Not applicable for anonymized aggregate study data. Confirm journal-specific requirements before submission.

Funding

Not stated in the dissertation excerpt reviewed for this manuscript.

Conflict of interest

Not stated in the dissertation excerpt reviewed for this manuscript.

Data availability

Data availability statement should be completed according to the institution and journal policy.

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