NEWS LINE

KARNATAKA ENDOCRINE SOCIETY

8th Issue | October 2025

Critical Endocrine Emergencies: Conditions Every Physician Should Recognize

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PRESIDENT'S MESSAGE

Dear Colleagues,
It is an honor to serve as the President of the Karnataka Endocrine Society (KES). I am deeply grateful to each one of you for entrusting me with this responsibility, and I look forward to contributing to the growth and development of our society.

KES has been committed to advancing academic activities, such as the monthly case discussions among Endocrinologists across our state, the annual Hormone Rhythm,Endosphere- the winter session conference and the quarterly Newsletter.

I am pleased to share that our newsletter continues to receive positive feedback from physicians and other specialists alike. This current edition focuses on the important and often under-discussed topic of endocrine emergencies. Our team members have covered all thr topics comprehensively. We hope it will be a valuable resource for physicians, intensivists, emergency doctors, and medical trainees, enhancing their skills in recognizing and treating these critical conditions.

I would like to express my sincere gratitude to the editorial board and all the contributors who worked tirelessly to bring this issue to life. Your efforts in presenting practical insights in such a clear and accessible manner are truly commendable.

As always, we at KES welcome your valuable feedback on the newsletter, as well as suggestions for future topics that you feel important. Your input is crucial in helping us continue to improve ourselves.

Warm regards,

FROM THE EDITORS' DESK

Dear Readers,
It gives us great pleasure to present the 8th edition of the Karnataka Endocrine Society Newsletter, centered around the critical theme of Endocrine Emergencies. These acute, often life-threatening conditions- ranging from myxedema coma and thyroid storm to adrenal crisis and severe hyper- or hypoglycemiadem and prompt recognition and timely intervention. With increasing awareness and multidisciplinary collaboration, outcomes can be significantly improved.

This issue brings together insightful articles and clinical perspectives aimed at both educating and equipping healthcare professionals to manage these emergencies more effectively. We extend our heartfelt thanks to all contributors for their time, expertise, and dedication in bringing this edition to life.

As always, we welcome your feedback, suggestions, and article recommendations for future issues. Your input helps us shape a more engaging and informative newsletter for our growing KES community.

Warm regards,

Dr Rajeshwari
President

Dr. Belinda George
Honorary Secretary

Karnataka Endocrine Society

Dr Aditi Chopra

Dr Vijay Sarathi

Editorial Board



Dr Bhagyashree R
Dr Riddhi Dasgupta
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DIABETIC KETOACIDOSIS (DKA): A METABOLIC STORM IN DIABETES

Introduction :

Diabetic ketoacidosis (DKA) is a life-threatening acute complication of diabetes that continues to challenge clinicians worldwide. Although most common in type 1 diabetes, it also occurs in type 2 diabetes, particularly in ketosis-prone forms. Advances in care have improved survival, yet DKA remains a leading cause of diabetes-related morbidity and mortality.

Definition :

It results from absolute or relative insulin deficiency combined with an increase in counter-regulatory hormones (glucagon, cortisol, catecholamines, growth hormone), leading to hyperglycaemia, ketonaemia, and metabolic acidosis .

The current diagnostic criteria involves :

'D' (diabetes) – a blood glucose concentration of >200mg/dl (11.0 mmol/L) or known to have diabetes mellitus

'K' (ketone) – a capillary or blood ketone concentration of >30mg/dl (3.0 mmol/L) or significant ketonuria (2+ or more on standard urine sticks)

'A' (acidosis) – a bicarbonate concentration of <15.0 mmol/L and/orvenous pH <7.3

(In the American Diabetes Association (ADA) 2024/2025 Standards of Care, the anion gap (AG) is no longer included in the diagnostic or severity classification of DKA)

Epidemiology and Risk Factors

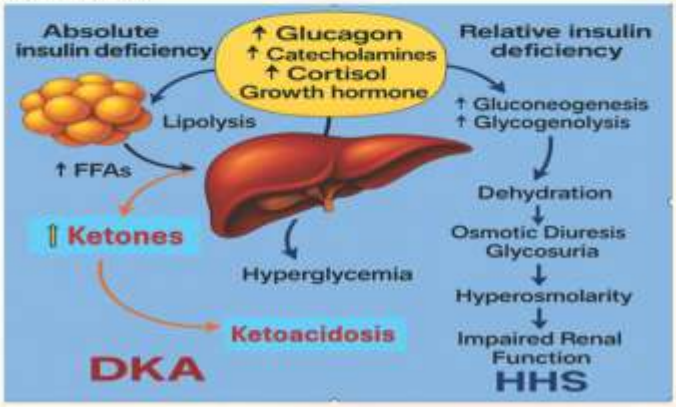
Hyperglycemic crises remain significant worldwide, accounting for nearly 1% of all diabetes-related hospitalizations. Among these, DKA contributes to more than a third of admissions. In children with new-onset type 1 diabetes, 15–70% present with DKA at diagnosis.

Precipitating factors :These have been summarized in Table 1below ;

Category	Examples / Details
1. Intercurrent Illness / Stressors	• Infection (most common) • Surgical stress • Trauma • Myocardial infarction • Cerebrovascular accident (stroke) • Sepsis
2. Insulin-Related Causes	• Inadequate dosing or omission (deliberate/accidental) • Broken insulin pen • Malfunctioning infusion pump • Errors in administration technique • Use of expired insulin
3. Human Factors	• Insulin erroneously withheld in hospital (e.g., perioperative/NBM mismanagement)
4. Pharmacological Triggers	• SGLT-2 inhibitors (classically linked to euglycemic DKA) • Corticosteroids • Thiazide diuretics • Pentamidine • Immune checkpoint inhibitors • Atypical antipsychotics
5. Other Clinical Situations	• New presentation of type 1 diabetes (common in children/adolescents) • Alcohol excess (alcoholic ketoacidosis overlap) • Pregnancy (increased insulin resistance, rapid progression to ketosis)

Pathophysiology

The pathophysiological hallmark of DKA and key differences from Hyperosmolar Hyperosmolar state (HHS) have been elucidated in Figure 1 below:



Clinical Features and Classification

Patients typically present with polyuria, polydipsia, weight loss, nausea, vomiting, abdominal pain, and lethargy. Signs include dehydration, tachycardia, tachypneoa, Kussmaul's breathing, and a fruity odor on the breath. The severity classification is guided by initial blood biochemistry as depicted in Table 2 below:

Table 2. Diagnostic Criteria and Severity Classification of DKA

Feature	Mild DKA	Moderate DKA	Severe DKA
Glucose (mg/dl)	>200	>200	>200
Ketones (β-hydroxybutyrate, mmol/L)	3–6	3–6	>6
pH	7.25–7.30	7.00–7.24	<7.00
Bicarbonate (mmol/L)	15–18	10–14	<10
Mental Status	Alert	Alert/drowsy	Stupor/coma
Suggested Care Level	Observation	Intermediate Care	ICU

Management

The goals of therapy are restoration of volume, clearance of ketones, correction of electrolyte imbalances, and identification of precipitating factors. The key facets of management are :

A.Fluidtherapy ;

The main aims for fluid replacement are:

- Restoration of circulatory volume
- Clearance of ketones
- Correction of electrolyte imbalance

Typical deficits seen in DKA are as follows:
Water - 100 ml/kg
Sodium - 7-10 mmol/kg
Chloride - 3-5 mmol/kg
Potassium - 3-5 mmol/kg

Crystalloids rather than colloid solutions are recommended for fluid resuscitation with 0.9% sodium chloride('normal saline') being the fluid of choice.Table 3 provides a rough guide for fluid replacement in DKA , which can be individualized as per patient's presentation and comorbidities :

Table 3:

Fluid	Volume & Duration
0.9% sodium chloride 1 L	1000 ml over 1st hour
0.9% sodium chloride 1 L with potassium chloride	1000 ml over next 2 hours
0.9% sodium chloride 1 L with potassium chloride	1000 ml over next 4 hours
0.9% sodium chloride 1 L with potassium chloride	1000 ml over next 6 hours

B.Insulin therapy

Intravenous insulin infusion of regular insulin is preferred to ensure steady plasma concentrations and predictable metabolic correction. The following are the key principles guiding insulin therapy:

- Usuallyregular insulin infusion is started at 0.1 units/kg/hour (typically 5–7 units/hour in adults) with hourly monitoring of capillary blood glucose
- Blood glucose falls by <50–70 mg/dL inover an hournecessitates anincrease in infusion rate by 1–2 units/hour.
- Most hospitals/institutes have their own insulin infusion protocols based on which rates of infusion are titrated to hourly capillary glucose levels
- Once blood glucose reaches 200–250 mg/dL, insulin infusion is reduced and add 10% dextroseis added to maintain glucose between 150–200 mg/dL until ketoacidosis resolves.
- Given the difference in half-lives between i.v and s.c insulin, care must be taken to overlap the i.v infusion with the first dose of sc insulin when patient is being switched from infusion to basal-bolus scregimen , once DKA resolve.

C. Potassium Replacement –

Potassium Level (mEq/L)	Potassium Replacement (mEq/L of infusion solution)
Over 5.5	Begin insulin infusion, no additional potassium replacement required
3.5 – 5.5	Begin insulin infusion and add potassium to each liter of IV fluids , with rates adjusted between 20-40 mEq /L infusion solution to keep potassium within the 4-5 mEq/L range.
Below 3.5	Do not start insulin infusion, additional potassium replacement at a rates sufficient to raise levels quickly > to 3.5 mEq/l , then restart insulin once levels are above 3.5 mEq/l

D. Bicarbonate therapy

Bicarbonate therapy in DKA is controversial because it has not been shown to improve outcomes, may worsen hypokalemia, can paradoxically slow ketone clearance by shifting the oxygen–hemoglobin dissociation curve and lead to paradoxical CNS acidosis. Current guidelines recommend its use only if arterial pH is <6.9, to mitigate severe acidosis and cardiovascular instability.

E. Phosphate therapy

Phosphate is not routinely corrected, and only indicated if there is severe hypophosphatemia leading to worsening respiratory failure, cardiac arrhythmias and rhabdomyolysis.

F. Ongoing monitoring while treating DKA

Frequency of Monitoring	Parameters to Check	Purpose
Hourly	- Capillary blood glucose (CBG) - Vital signs (HR, BP, RR, Temp, SpO₂) - Neurological status (GCS / sensorium) - Fluid balance (intake/output, urine ketones if available)	Ensure safe rate of glucose fall, early detection of hypoglycemia or cerebral edema, hemodynamic stability
Every 2–4 hours	- Serum electrolytes (Na^+, K^+, Cl^-, bicarbonate) - Venous blood gas (pH, bicarbonate, anion gap) - Ketone levels (serum/urine or bedside β-hydroxybutyrate if available)	Monitor correction of acidosis, electrolyte balance, adequacy of insulin and fluid replacement
Every 4–6 hours	- Urea, creatinine, osmolality (if available) - Complete clinical assessment (hydration, perfusion, respiratory pattern)	Detect evolving renal dysfunction, osmotic shifts, complications
Once daily or as indicated	- Full blood count - Infection screen (blood/urine culture, chest X-ray, as clinically indicated)	Evaluate for precipitating causes and complications

Criteria for remission of DKA :

Resolution of DKA is defined as :

Plasma ketone <0.6 mmol/L , venous pH ≥7.3 or bicarbonate ≥18 mmol/Lwith the blood glucose ideally <200 mg/dL ,and patient clinically stable and able to take orally.

Not a marker of resolution :

- The anion gap: may be misleading because of the presence of hyperchloremic metabolic acidosis caused by large volumes of 0.9% sodium chloride solution.
- Urine ketone: Because β-hydroxybutyrate is converted into acetoacetate as the acidosis improves, urinary ketone measurement not a criterion of resolution.

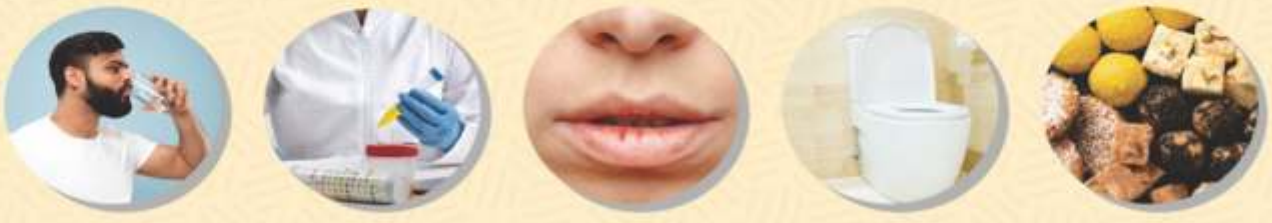
Complications of DKA

Complications include hypokalemia, hyperkalemia, hypoglycemia, cerebral edema, thromboembolic disease, and acute kidney injury. Rare complications include pulmonary edema, pancreatitis, cardiomyopathy, rhabdomyolysis, and GI bleeding.

Key clinical pearls:

Early recognition and prompt, protocol-driven therapy are the cornerstones of DKA management. Monitoring parameters closely at the bedside ensures safe recovery. Special populations such as the elderly, pregnant women, and those with renal or cardiac disease require individualized attention. Novel advances such as point-of-care ketone testing and digital monitoring systems are enhancing outcomes. DKA remains preventable, and structured patient education on insulin use and sick-day management is key.

Symptoms of Diabetic Ketoacidosis



HYPERGLYCEMIC HYPEROSMOLAR STATE (HHS): THE DEHYDRATION-DRIVEN DIABETIC EMERGENCY



Dr Srinath A Dr Mahesh DM Dr Shyam Sundar C M

Introduction

Among diabetic emergencies, diabetic ketoacidosis (DKA) is well recognized. Less familiar, but equally life-threatening, is the Hyperglycemic Hyperosmolar State (HHS). Unlike DKA, where acidosis predominates, HHS is primarily a dehydration-driven crisis. It is seen more often in older adults with type 2 diabetes, but can occur across age groups. Mortality remains high, ranging between 10–20%, emphasizing the need for early recognition and prompt management

Pathophysiology: Why Dehydration Matters

The hallmark of HHS is extreme hyperglycemia (often >600 mg/dL) leading to severe osmotic diuresis. As plasma glucose rises, renal glucose excretion pulls large volumes of water and electrolytes into the urine. Patients may lose 8–12 liters of fluid before presentation. Unlike DKA, where insulin deficiency drives lipolysis and ketone production, in HHS there is usually some residual insulin activity. This suppresses ketogenesis but is inadequate to prevent runaway hyperglycemia..

The result: a vicious cycle of worsening dehydration, increasing plasma osmolality (>320 mOsm/kg), impaired renal clearance of glucose, and progressive neurological dysfunction ranging from lethargy to coma.

Precipitating Factors

HHS is typically triggered by conditions that worsen dehydration or increase insulin resistance. Common precipitants include:

- Infections – pneumonia, urinary tract infections, sepsis
- Drugs – corticosteroids, thiazides, atypical antipsychotics
- Acute medical illness – myocardial infarction, stroke, pancreatitis
- Poor access to water – elderly or debilitated individuals unable to drink adequately
- Undiagnosed diabetes – occasionally, HHS may be the first presentation of diabetes

Clinical Features

The clinical picture is dominated by dehydration and neurological dysfunction rather than abdominal pain or Kussmaul breathing (seen in DKA).

- Dehydration signs: dry mucous membranes, hypotension, tachycardia, poor skin turgor
- Neurological changes: confusion, focal deficits, seizures, coma
- Polyuria and polydipsia may precede admission but are often missed in elderly patients

Importantly, the absence of significant ketosis may lead to underestimation of the seriousness of the illness.

Diagnostic Criteria (ADA/Endocrine Society)

- Plasma glucose > 600 mg/dL
- Effective plasma osmolality > 320 mOsm/kg
- Minimal or absent ketonuria/ketonemia
- Serum bicarbonate > 18 mmol/L, pH > 7.30

Electrolyte disturbances (sodium, potassium, phosphate) are common and require careful correction.

Management Principles

1. Fluid Replacement – the cornerstone
   - o Average deficit: 8–12 liters
   - o Initial: 0.9% saline, 15–20 mL/kg (about 1–1.5 L) in the first hour, unless contraindicated
   - o Adjust to 0.45% saline if corrected sodium is high
   - o Aim: replace half the deficit in first 12 hours, the rest in the next 12
2. Insulin Therapy
   - o Start only after partial fluid replacement (to avoid vascular collapse)
   - o IV infusion: 0.05 units/kg/hr (lower than DKA dose)
   - o Target: reduce glucose by 50–75 mg/dL per hour
   - o When glucose < 300 mg/dL, add dextrose infusion and continue insulin till osmolality normalizes
3. Electrolyte Correction
   - o Potassium: despite normal or high initial levels, total body potassium is depleted. Replace once urine output is established
   - o Phosphate and magnesium: correct if severe deficiency with symptoms
4. Identify and Treat Precipitating Cause
   - o Empiric antibiotics if infection suspected
   - o Manage comorbid events like MI or stroke
5. Monitoring
   - o Hourly vitals and fluid balance
   - o Frequent glucose and electrolyte checks
   - o Neurological monitoring for cerebral edema (rare but possible, especially if glucose falls too rapidly)

How HHS Differs from DKA

Feature	DKA	HHS
Age group	Younger (T1DM)	Older (T2DM)
Plasma glucose	250–600 mg/dL	>600 mg/dL
Ketones	Moderate to high	Absent or mild
pH	<7.3	>7.3
Osmolality	Mild increase	Markedly elevated
Fluid deficit	3–6 L	8–12 L
Mortality	<5%	10–20%

Practical Pointers

- Always consider HHS in an elderly diabetic presenting with dehydration and altered mental status
- Do not rely on ketones to exclude a hyperglycemic emergency
- Start with aggressive fluid replacement—insulin comes later
- Avoid rapid glucose correction; aim for steady decline to prevent cerebral edema
- Early referral to a higher-level care facility is advisable for patients with severe neurological impairment or hemodynamic instability

Prognosis and Aftercare

Mortality rates for HHS remain high (10–40%), largely due to underlying precipitating events and advanced age/comorbidities. Early recognition, rapid correction of dehydration, and prompt attention to underlying illnesses are essential for reducing morbidity and mortality.

Conclusion

HHS is a dehydration-driven diabetic emergency that requires a high index of suspicion. While less common than DKA, it carries higher mortality due to late diagnosis and coexisting comorbidities. Timely recognition and fluid-first management are key to improving outcomes. Remember: in HHS, rehydration is the most effective lifesaving therapy.

Dr Madhu Patil Dr Subramanian Kannan

SEVERE HYPOGLYCEMIA: THE UNDERESTIMATED MEDICAL EMERGENCY

Introduction:

Severe hypoglycemia remains one of the most underestimated medical emergencies in diabetes care. Despite the progress in glucose monitoring technologies and newer insulin analogs, it continues to impose significant risks on patients and challenges on healthcare systems (1,2). The event is not only frightening for patients and families but also associated with considerable morbidity, mortality, and healthcare costs (3,4).

Definition and Clinical Presentation:

Severe hypoglycemia is defined as any episode of hypoglycemia requiring assistance from another person to administer carbohydrates, intravenous glucose or glucagon (1). Unlike mild episodes that can be self-managed, severe events involve neuroglycopenic symptoms including confusion, seizures, loss of consciousness, and even coma (2). Warning symptoms of hypoglycaemia such as adrenergic features such as sweating, tremors, and palpitations is conspicuously absent particularly in patients with hypoglycemia related autonomic failure. The condition typically manifests when blood glucose levels fall below 40 mg/dl, however in some patients with recurrent hypoglycemia, this may occur at higher thresholds (55-70 mg/dl).

Burden and Mortality Risk:

Large observational cohorts highlight the significant mortality burden of severe hypoglycemia. Hospitalised patients with documented episodes of hypoglycemia have double the mortality compared with those without (4). Longitudinal studies in diabetes demonstrate that patients reporting severe hypoglycemia have a three- to fourfold higher risk of death within five years (5). The degree of glucose lowering directly correlates with adverse outcomes: inpatients with glucose <30 mg/dL show mortality rates over 8%, compared with less than 2% for those with glucose >40 mg/dL. These statistics emphasise that hypoglycemia is much more than just a transient complication, it is a marker of frailty and predictor of poor prognosis (4).

High-Risk Groups and Predisposing Factors: Recognising risk groups is critical for prevention:

1. Medication-Related Factors: Insulin therapy, especially intensive regimens, remains the leading contributor. Insulin combined with sulphonylureas and use of sulfonylureas such as glimepiride, glibenclamide which have active metabolites cleared by the kidneys, are strongly linked with severe hypoglycemia.
2. Patient Characteristics: Older age, long diabetes duration, low body mass index, renal impairment, advanced liver disease and history of prior severe hypoglycemia markedly raise the odds of severe hypoglycemia.
3. Hypoglycemic Unawareness: This condition results in impaired counter-regulatory responses and blunted autonomic warning signs, leading to recurrent, often unnoticed events (6). Patients with Type 1 Diabetes, Pancreatic Diabetes are prone to recurrent hypoglycemia and hence hypoglycaemic unawareness resulting in severe hypoglycemia.
4. Patients with gastroparesis learning to insulin meal mis-match and endocrine conditions including adrenal insufficiency, severe hypothyroidism, hypopituitarism can develop severe hypoglycemia due to lack of counter-regulatory hormone response.

Emergency Management Strategies:

Management depends on the patient ' s state of consciousness:

Conscious and able to swallow: Administer 15–20 g of fast-acting carbohydrate (e.g., 200-300 ml sugary juice (tetrapak) or 3-4 heaped teaspoons of sugar in water or 3-4 glucose tablets and reassess after 15 minutes, and repeat this cycle until glucose rises above 70 mg/dL. Avoid milk based candies as the protein in the milk may result in slower release of glucose. A longer-acting carbohydrate like a meal or a snack should follow this correction to maintain stability of glucose (2). Application or smearing honey in the bucal mucosa can assist in certain situations where one is not sure about the patient's ability to swallow and emergency help is yet to arrive. **Unconscious or Unable to Swallow:** Glucagon (1 mg intramuscularly or subcutaneously) is the first-line treatment in community and outpatient settings. Family members should be trained to use glucagon kits (2). Hospital-Based Care: Intravenous dextrose (25% dextrose, 100 mL) providesrapid correction. Recheck the glucose in 15 minutes and repeat this cycles till glucose is>70 mg/dl or patient regains consciousness. During this process, patients should be placed in a lateral position to reduce aspiration risk (2).

Prevention and Role of Technology

1. Medication Review: Avoid long acting sulphonylureas like glibeclamide/glimepiride, particularly in elderly patients or those with renal dysfunction.
2. Education: Patients and caregivers must be counselled on recognising early symptoms, carrying glucose, and using glucagon (2).
3. Structured Follow-Up: Regular review of home glucose records allows clinicians to identify patterns leading to hypoglycemia and make suitable changes to avoid hypoglycemia.
4. Technology Integration: Continuous glucose monitoring (CGM) has transformed hypoglycemia prevention. Real-time CGM provides alarms for impending lows and reduces hypoglycemia by 20–30% compared to finger-stick monitoring. CGM is particularly beneficial in those with hypoglycemia unawareness or frequent severe episodes (6).

Long-Term Consequences:

Severe hypoglycemia is not limited to acute risk; its long-term impact is equally concerning. Repeated episodes are linked with cognitive decline, falls, fractures, and reduced quality of life, especially in older adults. Fear of hypoglycemia often drives patients to maintain higher glucose targets, contributing to suboptimal control. From a healthcare perspective, hypoglycemia-related emergency visits and prolonged hospital stays are huge health care costs. These indirect burdens highlight the necessity of preventive approaches (7).

Clinical Implications: For frontline clinicians, severe hypoglycemia should be approached with the same urgency as myocardial infarction or stroke. Key implications include:

- Proactive risk stratification during routine visits.
- Ensuring access to glucagon kits and training families.
- Considering CGM in high-risk individuals.
- Implementing clear, standardised hospital protocols for recognition and treatment.

Conclusion: Severe hypoglycemia is a medical emergency with immediate and long-term consequences. It doubles mortality risk, impairs quality of life, and escalates healthcare costs. Clinicians must combine rapid treatment strategies with preventive measures, integrating patient education, safer prescribing, and technology such as CGM. With the rising global prevalence of diabetes, proactive hypoglycemia management should be embedded in every level of diabetes care.

Dr Manjunath P R

Dr Chitra Selvan

MYXEDEMA CRISIS: TRAGIC END OF UNTREATED HYPOTHYROIDISM

Introduction

Myxedema coma is the most severe, life-threatening form of hypothyroidism. Despite its name, most patients do not present in true coma but rather with altered sensorium ranging from confusion to stupor and eventually coma. It represents a state of severe thyroid hormone deficiency, often precipitated by systemic illness, medications, or other stressors. Mortality remains high, even with appropriate therapy, underscoring the importance of early recognition and prompt management.

Epidemiology

Myxedema coma is rare, with an estimated incidence of 0.22 per million people annually. It occurs most commonly in elderly women, often during the winter months when cold exposure can be a trigger. The rarity of the condition often delays diagnosis, particularly in non-endocrine settings, contributing to its poor outcomes. Reported mortality ranges between 30–60%, even in modern intensive care units.

Pathophysiology

The syndrome results from longstanding, untreated, or inadequately treated hypothyroidism. At the cellular level, thyroid hormone deficiency reduces basal metabolic rate, oxygen consumption, and heat production. This leads to hypothermia, hypoventilation, hypoglycemia, hyponatremia, and impaired cardiac contractility.

Precipitating factors commonly include:

- Infections (pneumonia, urinary tract infection, sepsis)
- Drugs (sedatives, opioids, amiodarone, lithium, anesthetic agents)
- Myocardial infarction, stroke, trauma, or surgery
- Non-adherence to levothyroxine therapy

The combination of hypothyroidism and a precipitating insult pushes the patient into a decompensated state where homeostasis fails, culminating in multi-organ dysfunction.

Clinical Features

The hallmark of myxedema coma is altered mental status. However, the presentation is often subtle and overlaps with many other critical illnesses, making clinical suspicion paramount.

Common manifestations:

- **Neurological:** Lethargy, slow mentation, confusion, psychosis , stupor, and coma.
- **Temperature:** Hypothermia (as low as 24–32°C), though fever may occur if infection is the trigger.
- **Cardiovascular:** Bradycardia, low-voltage ECG, decreased cardiac output, pericardial effusion, hypotension, and shock.
- **Respiratory:** Hypoventilation due to impaired ventilatory drive and muscle weakness, with CO_2retention.
- **Gastrointestinal:** Paralytic ileus, constipation, decreased bowel sounds.
- **Renal/Electrolytes:** Hyponatremia (due to impaired free water clearance, SIADH-like effect), hypoglycemia, and sometimes acute kidney injury.
- **Skin:** Cool, dry, coarse skin with non-pitting edema, loss of outer third of eyebrows, alopecia.

Diagnosis

There is no single diagnostic test for myxedema coma. Presence of altered mental status ,hypothermia and a precipitating event are the key features used to diagnose myxedema coma. Diagnosis is clinical, supported by laboratory findings.

Laboratory features:

- **Thyroid function tests:** Elevated TSH (in primary hypothyroidism) with low free T4. In secondary hypothyroidism (pituitary/hypothalamic causes), TSH may be low or inappropriately normal.
- **Other labs:** Hyponatremia, hypoglycemia, elevated creatinine kinase, respiratory acidosis with hypercapnia, leukocytosis if infection is present.

Scoring system

The Popoveniuc diagnostic score has been proposed to help stratify likelihood: points are assigned for thermoregulatory, CNS, cardiovascular, metabolic, and precipitating features. A score >60 is highly suggestive of myxedemacoma.There are other criteria based on clinical ,laboratory and imaging features but no consensus has been reached.

Management

Treatment should be initiated immediately when the diagnosis is suspected; waiting for laboratory confirmation can be fatal.

1. Supportive Care

- Airway and ventilation: Many patients require intubation and mechanical ventilation due to hypoventilation and CO_2retention.
- Hemodynamic support: Intravenous fluids for hypotension, but caution is needed due to the risk of hyponatremia and heart failure. Vasopressors may be needed if unresponsive to fluids and thyroid hormone replacement.
- Temperature regulation: Passive rewarming with blankets is recommended. Active rewarming may precipitate vasodilation and cardiovascular collapse.
- Infection control: Empiric broad-spectrum antibiotics until cultures are available.

2. Thyroid Hormone Replacement

There is ongoing debate regarding the optimal regimen. Options include intravenous (preferred) or oral therapy if IV is unavailable.

- Levothyroxine (T4): A loading dose of 200–400 µg IV, followed by 50–100 µg IV daily.
- Liothyronine (T3): More potent and rapid acting; can be used in combination at 5–20 µg IV loading, then 2.5–10 µg every 8 hours. However, it carries a higher risk of arrhythmias and should be used cautiously in elderly or cardiac patients.
- Practical approach: Many centers use IV T4 alone; some use T4 plus low-dose T3 in severe cases. Oral therapy may be considered if IV unavailable, though absorption can be unreliable in critically ill patients(oral 500mcg loading dose followed by tapering doses and maintaining at 1.6 – 2ug/kg at discharge).

3. Glucocorticoids

Hydrocortisone 50–100 mg IV every 6–8 hours is recommended until coexisting adrenal insufficiency is excluded. This prevents adrenal crisis since hypothyroidism may coexist with hypopituitarism.

4. Correction of Electrolytes and Hypoglycemia

- Hyponatremia: Treated with fluid restriction, hypertonic saline if severe/symptomatic.
- Hypoglycemia: IV dextrose infusion.

Approach to myxedema coma

ICU admission
Maintain airway, ventilatory support
Correct precipitating factors

BASELINE CORTISOL LEVEL

Thyroid hormone increases cortisol clearance

Coexisting with true AI

STRESS DOSE STEROIDS

THYROID HORMONE REPLACEMENT

Restoration of body temperature
Passive warming
Too aggressive rewarming
peripheral vasodilation
Shock

Correction of hypotension
Pressor might be required
Adrenal insufficiency

Correction of hyponatremia
Symptomatic or Na <120 mEq/L
Consider 3 % NaCl

Supportive care
Underlying infections/CHF
Dosage of meds modified based on altered distribution and slowed metabolism

Prognosis

Despite advances, mortality remains high (30–60%). Poor prognostic factors include advanced age, persistent hypothermia, bradycardia, sepsis, and delayed initiation of therapy. Survivors generally recover fully with long-term thyroid hormone replacement, but cognitive impairment may persist in some.

Prevention

Since most cases arise in individuals with untreated or inadequately treated hypothyroidism, prevention is possible:

- Regular screening and monitoring of thyroid function in high-risk populations (elderly women, known hypothyroid patients).
- Ensuring adherence to levothyroxine therapy.
- Educating patients and caregivers to recognize early signs of decompensation.
- Vigilance during intercurrent illness, surgery, or initiation of sedative medications in hypothyroid patients.

Key Takeaways for Clinicians

1. **Maintain high suspicion:** Elderly, hypothyroid patients with altered sensorium, hypothermia, and bradycardia should trigger consideration of myxedema coma.
2. **Do not delay therapy:** Begin thyroid hormone replacement and hydrocortisone empirically once suspected.
3. **Supportive ICU care:** Ventilatory, cardiovascular, and infection management are crucial for survival.
4. **Multidisciplinary approach:** Endocrinologists, intensivists, and primary physicians must work together to optimize outcomes.

Conclusion

Myxedema coma remains a rare but deadly endocrine emergency. Awareness among physicians and endocrinologists is vital, as prompt recognition and initiation of therapy can significantly reduce mortality. While treatment protocols may vary, the guiding principles remain rapid supportive care, thyroid hormone replacement, and glucocorticoid coverage. Preventive strategies through adequate treatment of hypothyroidism and early recognition of decompensation are key to reducing the incidence of this devastating condition.

THYROID STORM: LIFE-THREATENING EXACERBATION OF THYROTOXICOSIS

Dr Anusha Nadig Dr Hema Venkataraman

Introduction:

Thyroid Storm (TS) is defined as a life-threatening condition characterized by exaggerated signs and symptoms of thyrotoxicosis and evidence of multiorgan decompensation. While thyrotoxicosis is a condition characterised simply by elevated free thyroid hormone concentration in the serum, TS represents a life threatening exacerbation of thyrotoxicosis .Despite advances in recognition and treatment, mortality remains between 10-30%. Differentiating TS from uncomplicated severe thyrotoxicosis is crucial, since the former is life threatening and requires urgent, intensive care.

Incidence:

The incidence of TS ranges between 0.20 and 0.76 per 100,000 persons per year, with an incidence of 4.8–5.6 per 100,000 hospitalized patients

Precipitating factors:

TS most often occurs in patients with untreated or undertreated hyperthyroidism. Common underlying causes include Graves' disease, toxic multinodular goitre, and, less frequently, thyroiditis or exogenous ingestion of thyroid hormone. Abrupt discontinuation of antithyroid medications and infection are the most common underlying triggers. 25%-43% of patients may not have an identifiable trigger.

Most common causes –

- Underlying Graves' disease
- Infection

Treatment non-adherence, or interrupted treatment, with antithyroid medications

Other common causes

- Amiodarone
- Emotional stress
- Non-thyroid surgery
- Preeclampsia
- Pregnancy/labor
- Psychosis
- Trauma

Clinical Presentation:

Thyroid storm manifests with multi-system involvement

	Signs and Symptoms
Systemic	Fever is nearly universal (may reach 104-106F), Diaphoresis Weight loss
Cardiac	Tachycardia (sinus tachycardia, atrial fibrillation, ventricular fibrillation) Systolic heart failure with pulmonary and peripheral edema High-output heart failure (vasodilated, warm peripheral extremities) Wide pulse pressure with systolic hypertension
Gastro-intestinal	Nausea, vomiting, diarrhoea Abdominal pain
	Jaundice, hepatic injury/failure
Neurologic	Agitation, delirium, anxiety, psychosis, or coma
Other	Goitre Exophthalmos

Thyroid Storm mimics:

Several conditions can mimic TS like acute pulmonary edema, aortic dissection, alcohol withdrawal, septic shock, malignant hyperthermia, neuroleptic malignant syndrome, pheochromocytoma, and heat stroke

When should we consider the diagnosis of TS?

Due to the non-specific nature of presenting signs and symptoms and rarity of thyroid storm, diagnosis can be challenging. TS should be considered in any acutely deteriorating patient with underlying hyperthyroidism with evidence of multisystem involvement eg new-onset atrial fibrillation and/or dilated cardiomyopathy, new-onset delirium/psychosis plus abnormal vital signs, hyperthermia (temperature above ~40), sepsis without a focus of infection (i.e., distributive shock of unknown etiology). Elderly patients may lack florid symptoms and present with an apathetic TS.

What are the essential components of evaluation and pitfalls in diagnosis of TS?

The main pitfall in the diagnosis of TS is failing to consider the diagnosis of underlying thyrotoxicosis. TS is primarily a clinical diagnosis of multisystem deterioration in the presence of severe thyrotoxicosis. Laboratory values confirm thyrotoxicosis (elevated free T4/T3, suppressed TSH) but do not distinguish between TS and uncomplicated thyrotoxicosis.

Common scoring systems:

- Burch–Wartofsky Point Scale (BWPS) – assigns points to thermoregulatory, cardiovascular, neurological and gastrointestinal features.
- Japanese Thyroid Association (JTA) criteria – includes clinical and biochemical parameters.

Neither diagnostic tool is thought to be superior, but the scores can provide a framework by which clinicians can assess the likelihood of TS in a patient with thyrotoxicosis. Current recommendations are to apply both when considering a diagnosis of TS.Other laboratory findings that support the diagnosis include hyperglycemia, hypercalcemia, leukopenia, leukocytosis, or abnormal hepatic studies

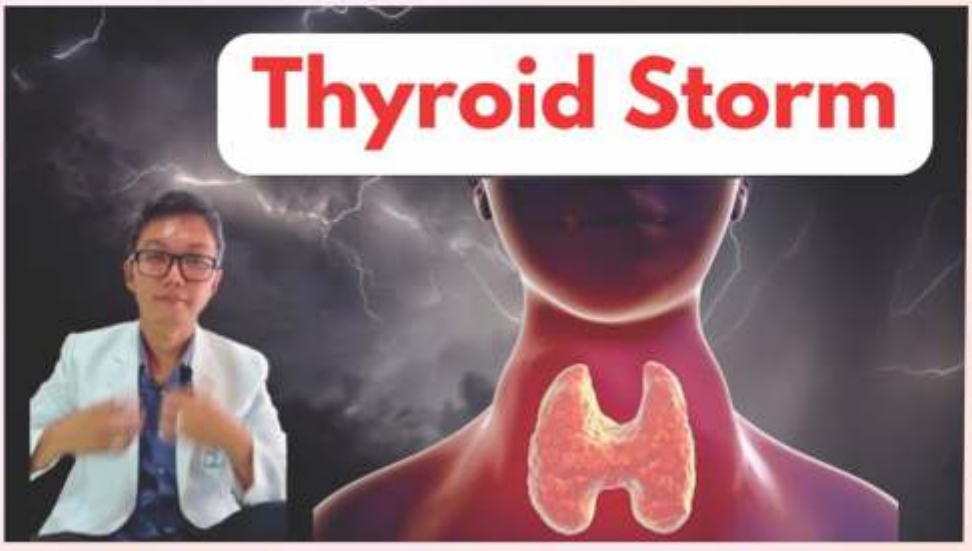
Management of TS:

The management of TS requires intensive care with a multidisciplinary team. Cardiac stabilization and resuscitation are integral components of therapy

1. **Supportive care:** IV fluids (guarded in decompensated heart failure), electrolyte correction, oxygen.
2. Acetaminophen for hyperthermia, along with implementation of peripheral cooling techniques (ice packs in groin/axillae, cooling blankets). Salicylates and NSAIDs should be avoided, as they can increase circulating free T4 levels
3. Restlessness, delirium, and psychosis can be treated with antipsychotics like risperidone or olanzapine, or benzodiazepines. Haloperidol may precipitate a thyroid storm.
4. **Targeted therapy for thyrotoxicosis**
    - Antithyroid drugs: Propylthiouracil (PTU) or methimazole to inhibit hormone synthesis. PTU also reduces peripheral conversion of T4 to T3.
    - Iodine (e.g., Lugol's iodine, potassium iodide) given at least 1 hour after thionamide to block hormone release.
    - β-blockers: Propranolol (oral/IV) or esmolol (IV infusion) for heart rate control and sympathetic overactivity.
    - Glucocorticoids: dual purpose of preventing adrenal insufficiency in thyroid storm as well as reducing peripheral conversion of T4 to T3. Intravenous Hydrocortisone is the first line recommended steroid. Dexamethasone may be also be considered
    - Cholestyramine:to enhance hormone clearance as adjunctive therapy
5. **Treating the underlying trigger:** Antibiotics for infection, management of myocardial infarction, withdrawal of precipitating drugs.
6. **Refractory cases:** Consider plasmapheresis, hemoperfusion, or emergency thyroidectomy
7. **Care after the acute episode:** Definitive treatment of hyperthyroidism should be considered following acute treatment with either surgery or Radio-iodine

Conclusion:

Thyroid storm is an endocrine emergency associated with significant morbidity and mortality ,requiring a multidisciplinary approach to treatment. Despite the presence of several scoring systems and laboratory tests, the diagnosis of TS remains predominantly clinical. It therefore requires the treating physician to have a high index of suspicion of firstly, underlying thyrotoxicosis and secondly, TS in any acutely deteriorating patient with thyrotoxicosis.



ADRENAL INSUFFICIENCY: AN ACUTE DEFICIENCY OF LIFE SAVING STEROIDS




Dr Sonali Appaiah Dr Belinda George Dr Ganapathi Bantwal Dr Vageesh Ayyar

Adrenal insufficiency (AI) is an endocrine disorder characterized by an absolute or relative deficiency of cortisol production.

Primary AI (PAI) (Adrenal aetiology of AI) is rare, with a prevalence of 10–20 persons per 100,000 population, while secondary AI (SAI) (Central aetiology of AI) is relatively more common than PAI with a prevalence of 15–42 persons per 100,000 population.

Most common cause of SAI is glucocorticoid induced AI (GIAI) due to rapid tapering or sudden stoppage of glucocorticoid therapy i.e oral, inhaled, or topical glucocorticoids equivalent to more than 5mg prednisone given for at least 3 weeks.

Acute AI or adrenal crisis (AC) is a life-threatening medical emergency affecting patients with AI(Table 1).

Table 1. Definition of Adrenal Crisis (Modified from Allolio et al)
(A): Major impairment of general health with at least two of the following signs/symptoms
· Hypotension (systolic blood pressure < 100 mmHg)
· Nausea or vomiting
· Severe fatigue
· Fever
· Somnolence
· Hyponatraemia (≤ 132mmol/l) or hyperkalaemia
· Hypoglycaemia
(B): Parenteral glucocorticoid (hydrocortisone) administration followed by clinical improvement

Cortisol Replacement Therapy (CRT), which has been available since 1950 has significantly improved the longevity and quality of life of patients with AI. CRT is done easily with oral hydrocortisone15–25 mg/day(in two to three divided doses) or prednisolone 3–5 mg/day. [5]

However, despite wide availability and ease of CRT, the incidence of AC continues to be as high at 5–10 events per 100 patient- years, with a mortality rate of 0.5 per 100 patient-years. [4]

In healthy individuals, there is an increase in cortisol hormone production during critical illness, trauma, anaesthesia, and surgery, with a great interindividual variation. This enhanced cortisol production is necessary to prevent overshooting of immune response mechanisms (e.g. cytokine release) and resultant detrimental toxicity.

In subjects with AI,these physical or emotional stressful conditions, or non-adherence to glucocorticoids could precipitate AC.This can be prevented by stress dosing of glucocorticoids (increasing dose of oral glucocorticoid or administration of parenteral glucocorticoids) during these situations to prevent AC. (Table 2)

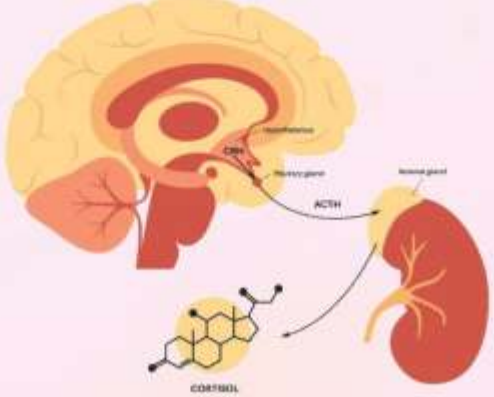


Table 2: Management of Adrenal insufficiency in specific conditions (Modified from Breonstein et al)		
1	Home management of illness with fever	Hydrocortisone replacement doses doubled (>38°C) or tripled (>39°C) until recovery (usually 2 to 3 d); increased consumption of electrolyte-containing fluids as tolerated
2	Unable to tolerate oral medication due to gastroenteritis or trauma	im or sc hydrocortisone 100 mg. To be repeated after 6–12 h until recovery. To go to hospital at the earliest after emergency injection hydrocortisone.
3	Significant emotional or mental stress (e.g.: Death of a close relative or writing board examination)	To add 10–20 mg of tablet hydrocortisone to daily replacement dose.
4	Exhaustive strenuous exercise	To intake 10 mg of tablet hydrocortisone 30–60 min before exercise.
5	Minor to moderate surgical stress	Hydrocortisone, 25–75 mg/24 h (usually 1 to 2 d)
6	Major surgery with general anaesthesia, trauma, delivery, or disease that requires intensive care	Hydrocortisone, 100 mg per iv injection followed by continuous iv infusion of 200 mg hydrocortisone/24h (alternatively 50 mg every 6 h iv or im)
7	Acute adrenal crisis	Rapid infusion of 1000 mL isotonic saline within the first hour or 5% glucose in isotonic saline, followed by continuous iv isotonic saline guided by individual patient needs. Hydrocortisone 100 mg iv immediately followed by hydrocortisone 200 mg/d as a continuous infusion for 24 h, reduced to hydrocortisone 100 mg/d the following day

Patient education is the key to prevent AC. All patients with AI should be educated regarding AI, symptoms of AC, daily dose, timing, importance of compliance to CRT, oral stress dosing of glucocorticoids, and situations where stress dosing must be followed.(Table3)

Table 2: Main points for education of patients with Adrenal Insufficiency and their family members on self-management for Adrenal crisis prevention
Explain symptoms and signs of emergent AC like hypotension or giddiness, nausea, vomiting, loss of appetite, abdominal pain, fever, severe fatigue, somnolence, hypoglycaemia, and hyponatremia or hyperkalaemia.
To ensure a sufficient supply of glucocorticoid tablets accounting for probable sick days.
To ensure frequent checks on the expiry date of both oral medication and hydrocortisone injection and to dispose of medications that have passed the expiry date.
Discuss situations requiring oral glucocorticoid dose adjustment and parenteral self-administration of hydrocortisone emergency injection.
To check every patient has a steroid emergency card (with diagnosis and advice on need for injection Hydrocortisone) and reinforce that it must be always carried by them and in case of illness to be shown to health care professionals for prompt action in emergencies.
Must ensure every patient has a hydrocortisone emergency injection kit (comprising a vial of hydrocortisone 100 mg injection with sterile water, 2 cc syringe, and needle and insulin syringe) for possible sick days and teach patient (and attender) self-administration subcutaneously (with insulin syringe after reconstitution with 1 ml sterile water) or intramuscularly.
Reinforce the need to go to the hospital after an emergency hydrocortisone injection and in case of worsening condition of the patient during illness despite stress dosing of glucocorticoid.
To reinforce the need to communicate about diagnosis of AI to any treating physician or surgeon, to alert the doctor to look at possible interaction with glucocorticoid tablets when initiating medications for other illnesses or comorbidities.

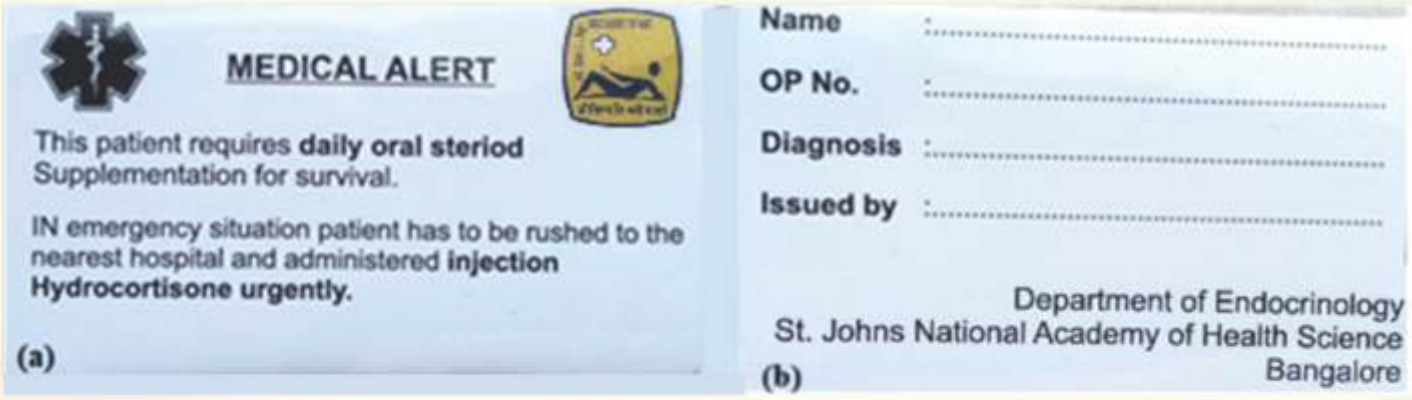


Figure 1: Steroid Emergency Card (used at St John's hospital, Bangalore) a) Front of card. Information regarding the need for daily oral glucocorticoid and injection of hydrocortisone in emergency situations was mentioned. b) Back of card. Space is provided to enter patient details and diagnosis of the patient.

In a questionnaire-based study done to assess knowledge and practice among patients with AI at our centre, it was seen that despite prior education there continues to be a deficit in knowledge and self-management among individuals with AI.

Thus, it is pertinent to reassess knowledge, educate and reinforce good practices at every follow up visit to prevent AC and improve the quality of life in individuals with AI.

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HYPONATREMIA: TRAGIC END OF UNTREATED HYPOTHYROIDISM

Hyponatremia is defined as serum sodium of < 135 mmol/L. An approach to a case of hyponatremia is summarized in Flowchart 1.

Case 1

A 55-year-old obese male presented for a routine check-up with generalized fatigability. He had no nausea, vomiting, diarrhea, excessive water intake, or history suggestive of cardiac, hepatic, or renal disease. On examination, blood pressure (BP) was 128/78 mmHg, heart rate (HR) 82/min, with an overweight built but no edema or dehydration. Laboratory evalaution showed serum sodium 124 mmol/L, potassium 4.3 mmol/L, creatinine 0.9 mg/dL, plasma glucose 108 mg/dL, serum total proteins 6.9 g/dl, serum triglycerides of 4800 mg/dL, cholesterol 500 mg/dL and glycated hemoglobin (HbA1c 5.6%). Serum osmolality was 292 mOsm/kg.

A low serum sodium but normal serum osmolality indicated pseudohyponatremia. As the patient had normoglycemia and normoproteinemia but marked hyperlipidemia, pseudohyponatremia was attributed to hypertriglyceridemia.

Management: He was advised to moderate carbohydrate and fat consumption and initiated on oral fenofibrate 160 mg/day, and Omega 3 fatty acid 300 mg thrice a day. Follow-up after 2 months showed serum triglycerides of 800 mg/dl with serum sodium of 133 mmol/L.

Learning Points:

1. Always correlate serum sodium level with serum osmolality to distinguish true from pseudo-hyponatremia.
2. Pseudohyponatremia arises from hypertriglyceridemia, hyperproteinemia, or marked hyperglycemia and does not need sodium correction.

Case 2:

A 32-year-old male presented with two days of profuse watery diarrhea, vomiting, weakness, and poor intake. He had no comorbidities. On examination, he was lethargic, BP 94/60 mmHg, pulse 112/min, with dry mucous membranes and poor skin turgor. Laboratory evaluation showed sodium 122 mmol/L, potassium 3.0 mmol/L, BUN 32 mg/dL, creatinine 1.1 mg/dL, serum osmolality 265 mOsm/kg, and urine sodium <20 mmol/L.

History of acute gastroenteritis with dehydration and low urinary sodium indicated the diagnosis of hypovolemic hyponatremia. The patient received intravenous rehydration with normal saline, along with potassium supplementation and intravenous ondansetron 4 mg. Serum sodium after 6 hours was 134 mmol/L. Later, oral rehydration was added.

Learning Points:

1. Volume status assessment is central to hyponatremia evaluation and management. Recognition of not only hypovolemia but also hypervolemia (edema) is crucial for the etiological diagnosis of hyponatremia.
2. Low urinary sodium indicates hypovolemic hyponatremia and differentiates it from euvolemic hyponatremia.

Case 3:

A 27-year-old lady presented with progressive generalized weakness and altered sensorium for one day. She had a prior similar hospitalization. Nine months earlier, a massive postpartum hemorrhage required hysterectomy, after which she could not lactate and later developed reduced appetite, weight loss and no resumption of menstrual cycles. On examination, she was pale, lethargic, BP 90/60 mmHg, HR 58/min. Sodium was 114 mmol/L, potassium 4.8 mmol/L, urinary sodium 40 mmol/L, serum osmolality 258 mOsm/kg. Further evaluation revealed morning cortisol 1.8 µg/dL, free T4 0.4 ng/dL with inappropriately normal TSH (6.8 µIU/mL), low estradiol (<10 pg/ml), inappropriately normal follicle stimulating hormone (3.1 IU/L) and low prolactin (1.1 ng/ml). The MRI pituitary showed a partially empty sella.

The above findings were consistent with the diagnosis of Sheehan's syndrome with central adrenal insufficiency, central hypothyroidism, and hypogonadotropic hypogonadism.

She received intravenous hydrocortisone (100 mg bolus, later 50 mg Q6h). Sodium improved to 120 mmol/L in 4 hours. She was later transitioned to oral hydrocortisone (10–5–5 mg) and started on levothyroxine (75 µg/day) and cycle estrogen and progesterone.

Learning Points:

1. Low free T4 with mildly elevated TSH should not be mistaken for subclinical hypothyroidism; this indicates central hypothyroidism and requires pituitary evaluation.
2. Amenorrhea and lactation failure after postpartum hemorrhage are key clues to diagnosing Sheehan's syndrome in hyponatremia evaluation.

Case 4

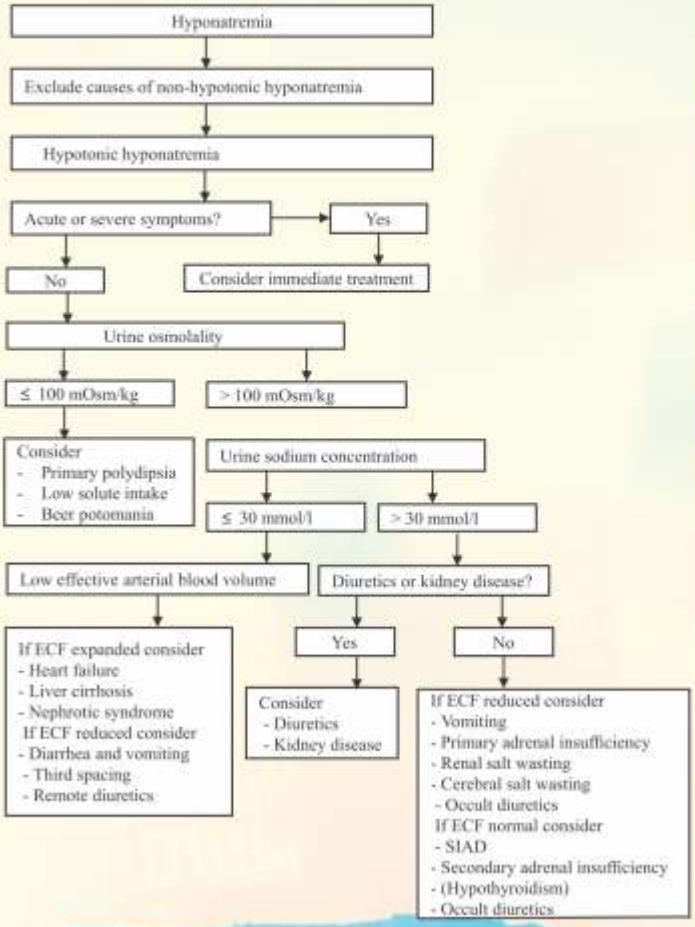
A 72-year-old retired schoolteacher presented with two days of confusion, unsteady gait, and recurrent falls. Family reported lethargy and poor appetite. He had no vomiting, diarrhea, polydipsia, or diuretic use. Past history: hypertension on amlodipine. On examination, he was drowsy but arousable, BP 132/76 mmHg, HR 78/min, with no dehydration, edema, or ascites. The neurological exam showed mild disorientation but no focal deficits. Laboratory evaluation showed sodium 112 mmol/L, potassium 4.1 mmol/L, BUN 12 mg/dL, creatinine 0.8 mg/dL, serum osmolality 260 mOsm/kg, urine sodium 48 mmol/L, urine osmolality 420 mOsm/kg. Morning cortisol and thyroid function tests were normal. Chest X-ray showed a left upper lobe lung mass.

No evidence of hypovolemia or hypervolemia with normal adrenal and thyroid status with the background of lung mass indicated the diagnosis of syndrome of inappropriate antidiuretic hormone (SIADH), likely paraneoplastic. Patient was managed with 3% hypertonic saline (100 ml over 20 min) followed by 30 ml/hour. Sodium after 1, 2, 4, 6, 12, 24 hours were 114, 115, 115.5, 116, 117, 121 mmol/L. 24 hours later, oral tolvaptan 15 mg was initiated and fluid restriction (800 mL/day) was advised.

Learning Points:

1. SIADH is a diagnosis of exclusion; hypothyroidism, adrenal insufficiency, renal disease, and diuretic use must be ruled out.
2. Plasma/urine osmolality and urine sodium are critical in distinguishing SIADH from other causes.

Figure 1: Flowchart depicting approach to hyponatremia



Dr Aditi Chopra

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SEVERE HYPOCALCEMIA: A TROUSSEAU OF TROUBLE

Introduction

Acute hypocalcemia is a true endocrine emergency that can be rapidly fatal if not recognized and managed promptly. Calcium is essential for neuronal excitability, muscle contraction, and cardiac function; even small fluctuations can have profound consequences. Severe hypocalcemia is defined as either a corrected serum calcium <7.5mg/dlor the presence of symptoms and signs at any level below the normal reference range.

The clinical spectrum ranges from subtle neuromuscular irritability to seizures, laryngospasm, and life-threatening cardiac arrhythmias. Importantly, the rapidity of calcium decline often predicts severity better than the absolute value.

Pathophysiology

Calcium homeostasis is maintained by the tightly integrated actions of parathyroid hormone (PTH), vitamin D metabolites, renal excretion, and bone buffering. Hypocalcemia develops when one or more of these regulatory pathways fail:

Category	Examples & Mechanism
Reduced PTH secretion or action	- Post-surgical hypoparathyroidism (after thyroidectomy/parathyroidectomy, most common), Post radiation - Autoimmune and genetic hypoparathyroidism - Pseudohypoparathyroidism
Vitamin D deficiency or resistance	- Nutritional deficiency (low dietary intake, inadequate sunlight) - Malabsorption syndromes - Chronic liver disease (impaired 25-hydroxylation) - Vitamin Ddependent rickets or end-organ resistance
Renal failure	- Phosphate retention → secondary hypocalcemia - Impaired calcitriol synthesis due to loss of renal 1α-hydroxylase activity
Acute illness factors	- Severe pancreatitis (fat necrosis with calcium saponification) - Rhabdomyolysis - Tumor lysis syndrome - Sepsis - Massive blood transfusion (citrate binding calcium)
Drugs	- Bisphosphonates - Denosumab - Cisplatin - Proton pump inhibitors (via hypomagnesemia) Anticonvulsants (phenytoin)

Clinical Presentation

Symptoms typically appear when calcium falls below ~ <7.5mg/dl, though thresholds vary with chronicity.

- Neuromuscular
  - Perioral numbness, digital paresthesias, cramps, carpopedal spasm, tetany and seizures.
  - Bedside signs:
    - Trousseau's sign: Inflate a blood pressure cuff slightlyabove systolic level for 3 minutes →observe for carpopedal spasm (flexion at wrist, MCP joints, extension of fingers).
    - Chvostek's sign: Tap the facial nerve just anterior to the ear at the angle of the jaw →observe for twitching of ipsilateral facial muscles.
- **Respiratory**
  - Laryngospasm, bronchospasm, stridor, potentially fatal airway compromise.
- **Cardiovascular**
  - Prolonged QT interval, hypotension, heart block, and ventricular arrhythmias.
  - In severe cases, cardiomyopathy or acute heart failure.
- **Neuropsychiatric**
  - Anxiety, irritability, depression, confusion, or frank delirium.

Investigations

Evaluation aims to confirm true hypocalcemia and identify reversible causes:

- Corrected total calcium (mg/dL):
  Corrected calcium = Measured Ca + 0.8 × (4 – albumin g/dL)
- Ionized calcium – gold standard, unaffected by albumin.
- Serum phosphate – often elevated in hypoparathyroidism.
- Serum magnesium – deficiency causes PTH resistance and impaired secretion.
- PTH levels – low in hypoparathyroidism; high in vitamin D deficiency.
- 25-hydroxyvitamin D – to detect deficiency or malabsorption.
- Renal function tests – urea, creatinine, electrolytes
- ECG – to detect QT prolongation and arrhythmias

Management

Treatment must address three urgent priorities:

1. Rapid correction of calcium
2. Stabilization of cardiac and neuromuscular function.
3. Management of underlying cause.

1. Intravenous Calcium Replacement

- **Bolus:** 10mlof 10% calcium gluconate (≈92 mg elemental calcium) diluted in 50 mL 5% dextrose, infused over 10–20 min with continuous ECG monitoring.

  Repeat dosing: If tetany, seizures, or arrhythmias persist.
- **Continuous infusion:** Dilute 100 mL(10 ampoules) of 10% calcium gluconatein 1 L of dextrose/saline, infuse at 50–100 mL/h, titrated to maintain calcium at the low-normal range.
- Precautions:
  - Avoid mixing with bicarbonate/phosphate (precipitation). Calcium chloride is more potent but should be given centrally due to extravasation risk

2. Correction of Contributing Factors

- Hypomagnesemia:
  - 2 g magnesium sulfate IV in 20 ml 5% dextrose over 10–20 min, followed by infusion at 1 g/h. (continue till Mg > 1g.dl)
- Hyperphosphatemia:
  - Dietary phosphate restriction and phosphate binders, especially in CKD.

3. Transition to Maintenance Therapy

- Oral calcium: Calcium carbonate or citrate 1–4 g/day in divided doses.
- Active vitamin D analogues: Calcitriol 0.25–1 mcg once or twice daily, especially in hypoparathyroidism.
  Vitamin D : Cholecalciferol or ergocalciferol for nutritional deficiency

4. Cause-Specific Considerations

- Post-thyroidectomy hypoparathyroidism:Calcium and calcitriol.
- CKD: Control phosphate, give calcitriol
- Pseudohypoparathyroidism: Higher doses of calcium and calcitriol to overcome resistance.

5. Monitoring and Safety

- ECG monitoring is mandatory during IV therapy, especially in patients on digoxin.
- Serum calcium rechecked every 4–6 hours during acute treatment.
- Long-term, aim for low-normal serum calcium to prevent hypercalciuria and nephrocalcinosis.

Long-Term Follow-Up

Patients on long term oral calcium and active vitamin D analogues require close monitoring initially (weekly–monthly), then every 3–6 months. Goals are symptom relief, biochemical stability, and avoidance of renal complications. Specialist endocrinology follow-up is recommended for all cases.

Conclusion

Severe hypocalcemia is a life-threatening but treatable emergency. Recognition of bedside signs such as Trousseau's and Chvostek's remains clinically valuable. Management requires rapid biochemical confirmation, urgent IV calcium administration, correction of magnesium deficiency, and attention to the underlying etiology. With guideline-directed acute therapy and vigilant long-term monitoring, morbidity and mortality can be substantially reduced.

Dr Afsar

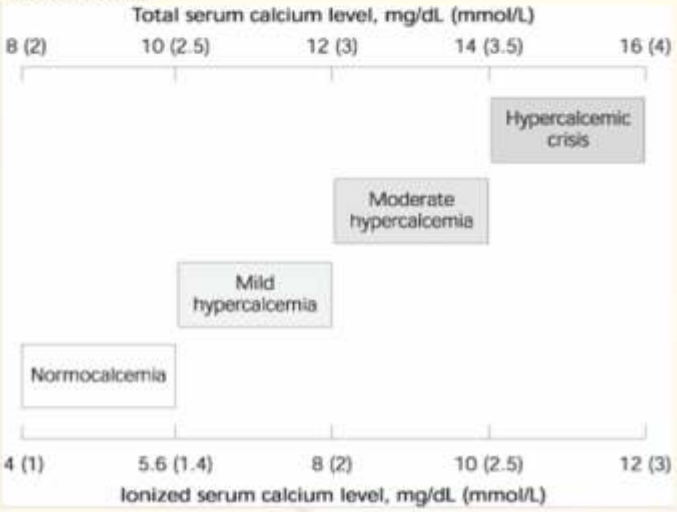
Dr Santosh B

HYPERCALCEMIC CRISIS: WHEN CALCIUM TURNS CRITICAL

Definition

Hypercalcemia is defined as serum calcium >10.5 mg/dL. A hypercalcemic emergency is acute severe hypercalcemia, with total calcium >14.0 mg/dL (3.5 mmol/L) or ionized calcium >1.6 mmol/L, leading to significant morbidity. Without urgent treatment, it may cause cardiac arrhythmias, acute renal failure, and altered mental status

Hypercalcemia



Common Causes

- Malignancy-Associated Hypercalcemia (MAH): commonest cause with >90% of hospitalized cases; mechanisms include humoral : PTHrP, 1-α hydroxylase activity; bone metastases, and multiple myeloma.
- Primary Hyperparathyroidism (PHPT)/ crisis: Usually mild but can cause crisis in large adenomas, cysts, carcinoma, or after dehydration, immobilization, or medications.
- Others: Addison's disease, severe dehydration, thiazides, vitamin A/D overdose, lithium, granulomatous diseases (sarcoidosis, TB, fungal infections, leprosy).
- Miscellaneous: Congenital hypercalcemia syndromes.

Clinical Manifestations

- Neurological: most evident - lethargy, confusion, restlessness, stupor, coma.
- Renal: Polyuria, polydipsia, nephrolithiasis, acute kidney injury.
- Musculoskeletal: Bone pain, fractures, muscle weakness, movement abnormalities, calcifications.
- Gastrointestinal: Nausea, vomiting, abdominal pain, constipation, pancreatitis.
- Cardiac: Arrhythmias, heart block, ST changes on ECG, potentiation of digoxin toxicity, hypertension, venous thrombosis.

Diagnostic Workup

- Serum Calcium: ionized or total -correct for albumin: Corrected Ca = Serum Ca + 0.8 × (4.0 – Serum Albumin)
- Parathyroid Hormone (PTH): Distinguish PTH-mediated vs. non-PTH-mediated hypercalcemia.
- Vitamin D Metabolites: 25(OH)D and $1,25(OH)_2D$.
- Renal Function/Electrolytes: BUN, creatinine, phosphate, magnesium.
- ECG: Shortened QT interval, risk of arrhythmias.

Management Principles

1. Immediate Stabilization

- Hydration: IV isotonic saline (bolus, followed by 200–500 mL/h depending on hemodynamic status).
- Loop Diuretics: Furosemide to enhance calciuresis.

2. Inhibition of Bone Resorption through osteoclasts

- Bisphosphonates: Cornerstone of therapy (Zoledronic acid 4 mg IV; Pamidronate 60–90 mg IV). Peak effect at 48 hrs, nadir by 1 week.
- Calcitonin: Rapid but short-lived effect; 4 U/kg SC q8–12h, glucocorticoids, with rare nausea, vomiting, abdominal cramps, flushing, local reaction
- Denosumab: 120 mg SC, days 1, 8, 15, 29th and every 4 weeks, effective in refractory or renal impairment cases.
- Other agents: Plicamycin- 15 to 25 ug/kg infused over 24 hours, Gallium nitrate- 200 mg/m2 over 5 day period as infusion. (limited by toxicity- liver, renal).

3. Adjunct Therapies

- Glucocorticoids: For granulomatous disease, vitamin D toxicity, lymphoma.
- Phosphate (IV/oral): Rarely used due to risk of soft tissue calcification.
- Dialysis: For refractory, life-threatening cases with renal failure.

4. Treat Underlying Cause

- Surgery for PHPT, withdrawal of offending drugs, specific malignancy treatment.

Symptoms of Hypercalcemia



Dr Vishal Lahoti Dr Tejaswi V Dr Basavaraj GS

PITUITARY APOPLEXY: PROBLEM AT ATTIC

Pituitary apoplexy (PA)is a rare but potentially life-threatening endocrine and neurological emergency characterized by the acute hemorrhage or infarction of the pituitary gland, most often within a preexisting pituitary adenoma. Early recognition and management are crucial for improving outcomes and minimizing morbidity.

Overview and Epidemiology

PA most commonly affects males between 50 and 60 years of age, though it can appear at any age, including rare cases in children and during pregnancy. The syndrome complicates 2%–12% of pituitary adenomas, with nonfunctioning tumors being particularly at risk. It can also, though less frequently, occur in otherwise normal pituitary tissue.

Pathophysiology and Risk Factors

The underlying mechanism typically involves a mismatch between the tumor's blood supply and its rapidly increasing metabolic demand, leading to hemorrhagic infarction. Risk factors for PA include hypertension, major surgery, anticoagulant therapy, dynamic pituitary testing, traumatic brain injury, pregnancy, and recent COVID-19 infection or vaccination.

Clinical Presentation

PA classically presents with the abrupt onset of severe headache—the hallmark symptom. Other features include:

- Visual impairment (diplopia, ptosis, field defects) due to compression of the optic chiasm or cranial nerves
- Nausea, vomiting, and signs of meningeal irritation
- Altered consciousness in severe cases
- Acute anterior pituitary hormonal deficiencies, notably ACTH (leading to life-threatening adrenal insufficiency) and TSH

Precipitating Factors

Documented triggers are identifiable in up to 30% of cases. Precipitating events should be sought in clinical history, especially perioperative stress or anticoagulation.

Diagnostic Approach

A high index of suspicion is required, especially in patients with known pituitary adenomas presenting with acute neuro-ophthalmologic symptoms. The following steps are critical:

- Urgent neuroimaging: MRI is preferred, revealing hemorrhage or infarction within the gland or tumor
- Assessment of pituitary hormone axes: Immediate evaluation of cortisol, thyroid, and electrolytes is mandatory, but treatment should not be delayed for lab results
- Visual field testing and fundoscopy: To evaluate optic pathway involvement

Acute Management

Pituitary apoplexy demands immediate stabilization:

- Glucocorticoid replacement: Start intravenous hydrocortisone promptly, even before diagnostic confirmation, to prevent adrenal crisis (e.g., 100 mg bolus IV followed by 200 mg over 24 hours)
- Fluid and electrolyte correction: Monitor and correct sodium and other abnormalities
- Thyroid replacement: Consider after steroids are initiated if hypothyroidism is present
- Neurosurgical consultation: Early involvement for possible decompression if severe visual impairment or altered sensorium persists despite hormonal correction
- Multidisciplinary care: Coordination among endocrinologists, neurosurgeons, and ophthalmologists is essential

Surgical Versus Conservative Management

Historically, PA was a neurosurgical emergency requiring rapid decompression. However, most recent evidence suggests that in patients without significant or progressive visual loss and with stable consciousness, conservative management with close observation and steroids may suffice, yielding outcomes comparable to surgery. Surgery is indicated if:

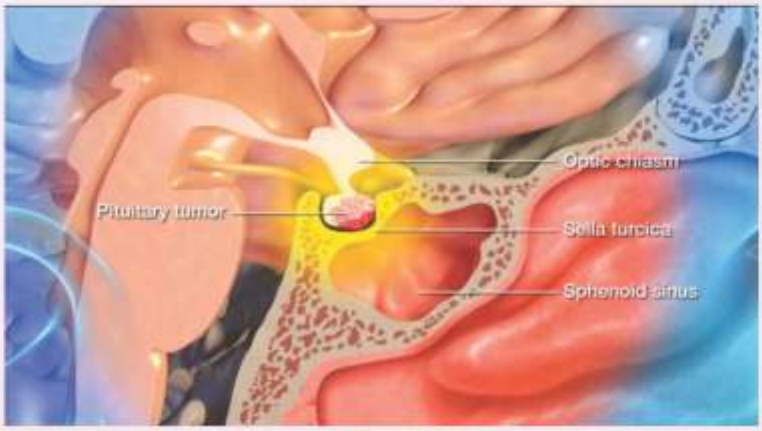
- Worsening or severe visual loss persists after stabilization
- Deterioration of consciousness
- Failure of conservative management

Prognosis and Follow-Up

Long-term endocrine and visual deficits are common, requiring endocrinology follow-up for hormonal replacement and tumor surveillance. Some patients may recover most pituitary function, while others need lifelong hormonal therapy.

Key Takeaways for General Practice

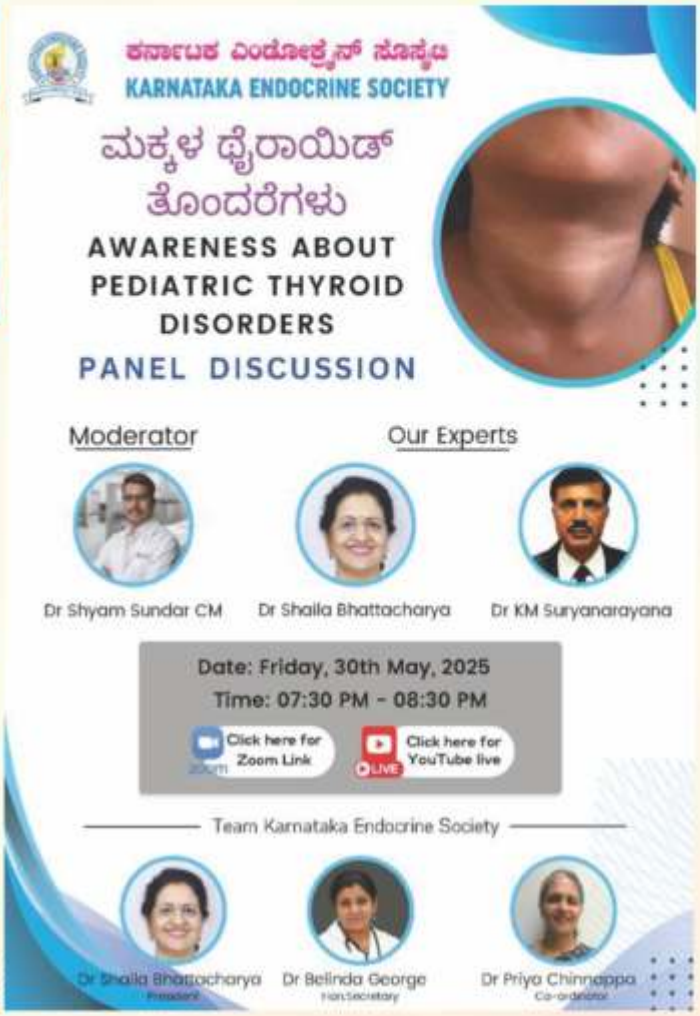
- Recognize pituitary apoplexy as a true emergency with potentially subtle presentations.
- Do not delay corticosteroid therapy for laboratory confirmation in suspected cases.
- Visual symptoms and altered consciousness mandate urgent imaging and referral.
- Collaborate with multidisciplinary teams for individualized care.



SOCIETY ACTIVITIES

Hormone Rthythm 2025, Kalaburagi

PUBLIC AWARENESS PROGRAMMES



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UPCOMING EVENTS

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