NEWSLETTER
DEC 2024
Volume 28 - Issue 4

CAPE News

Newsletter of
The Indian Society for Pediatric and Adolescent Endocrinology (ISPAE)

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WATER AND ELECTROLYTE DISORDERS

Wishes for the New Year!

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EDITOR'S MESSAGE

Dear Readers,

We are happy to present the last and final issue of CAPE News for the year 2024. This issue details a few aspects on Water and Electrolyte Disorders that frequently perplex clinicians. Our contributors have penned down diagnostic approach and management of common water and electrolyte disorders in a simplified manner. The Trainees' Quiz is a simple, nice learning opportunity for all members. We request you to kindly submit your answers before the due date.

The last two months saw great vigor and zeal in all our ISPAE members who successfully completed different activities on the account of World Diabetes Day. The theme for this year was 'Breaking Barriers, Bridging Gaps'. We congratulate and thank all ISPAE members who continue to work towards this goal.

As we draw towards the end of this year, we are grateful to all the contributors who provided their inputs to ensure successful eight issues of CAPE News during 2023-2024. We hope the new team will receive your continued support in the next year. I look forward to more active participation by other members.

We are indeed honored to announce the new team of ISPAE who will formally take charge from Jan 2025 onwards under the leadership of Dr Anurag Bajpai. Congratulations to the new Team! We also look forward to the new Editorial team of CAPE News, which would be announced in 2025.

Bidding Adieu!

Aashima Dabas

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ISPAE PRESIDENT MESSAGE

Dear friends,

It's the time of the year to render thanks, and look forward to new beginnings!

The past two years have been an extremely fruitful one for our ISPAE-EC team.

We have managed to work fruitfully towards some of the goals set by us at the start of the tenure. Setting up of the **ISPAE Type 1 diabetes registry** has been a milestone in our work. Introduction of **PEPP** (Pediatric Endocrinology for Practicing Pediatricians) is an online program run every 3 months with Indian Academy of Pediatrics on the dIAP platform. These have run alternately with the other two programs:

1. **ACES** (Academic and Clinical Education Series) for pediatric endocrine fellows and pediatric endocrinologists
2. **PEP** (Pediatric Endocrinology for Postgraduates)

ISPAE-IDEAL team has continued its successful march with great dedication in improving lives of children with type 1 diabetes mellitus.

We have introduced 3 educational modules prepared by teams under the stewardship of Prof P. Raghupathy, Prof Aspi Irani and Prof Vaman Khadilkar on thyroid disorders, type 1 diabetes mellitus and growth, respectively. These have been built with the aim of improving awareness about pediatric endocrine disorders. We hope pediatric endocrinologists around the country use these.

Team CAPE NEWS under the lead of Dr Aashima Dabas and Dr Anju Virmani has been brilliant. The quarterly newsletters have highlighted academics, achievements and activities of our members and enriched the society.

On behalf of our whole EC Team 2023-2024 (Patrons Dr P. Raghupathy, Dr PSN Menon, Dr Vaman Khadilkar and immediate past president Dr Shaila Bhattacharya; Secretary & Treasurer Dr Rakesh Kumar, Joint Secretary Dr Sirisha Kusuma Boddu, Dr Ravindra Kumar, Dr Mahesh Maheshwari, Dr Jaivinder Yadav, Dr Amarnath Kulkarni, Dr Aayush Gupta, Dr Zalak Upadhyay, Dr Dr Chetan Dave; Team CAPE NEWS - Dr Anju Virmani, Dr Aashima Dabas, Dr Aaradhana Singh, Dr Medha Mittal, Dr Richa Arora, Dr Ruchi Shah, Dr Tejasvi Sheshadri, Dr Zalak Upadhyay, Web Team - Dr Mahesh Maheshwari, Dr Aayush Gupta, Dr Pragya Mangla), we thank all the members of ISPAE for giving us the honor of working for ISPAE as executive council members.

We wish the new Team ISPAE of Dr Anurag Bajpai the best!

We wish all our friends a fantastic new year!!!

Ahila Ayyavoo - on behalf of ISPAE 2023-2024

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TERM: 2025-26

REPORT ON ISPAE ELECTIONS 2024

Dr Mahesh Maheshwari, Returning Officer, ISPAE Election 2024

The term of the present Executive Council of the Indian Society for Pediatrics & Adolescent Endocrinology (ISPAE) is expected to finish on 31 December 2024. In pursuance of the Society constitution, I was nominated as Returning Officer for ISPAE election for the next term. The election process to elect the office bearers and executive council members for the years 2025-26 was initiated on 20 September 2024 and completed on 17 November 2024.

Nominations were received for all the posts advertised; after the withdrawal of nominations, elections were conducted for one post of Secretary General and seven posts of Executive Council members. All other candidates were elected unanimously for different posts. Elections were held through E-voting. Eligibility of voters was based on e-mail available in the ISPAE database till 31 August 2024. Out of 541 eligible voters, 259 (47%) cast their votes.

Welcome to the new ISPAE Council 2025-2026

President: Dr Anurag Bajpai
Secretary: Dr Ravindra Kumar
Treasurer: Dr Jaivinder Yadav
Joint Secretary: Dr Saurabh Uppal
EB members: Dr Aayush Gupta, Dr Ayesha Ahmad, Dr Chetan Dave, Dr Parvathi L, Dr Rahul Jahagirdar, Dr Vijay Jaiswal, Dr Zalak Upadhyay

I congratulate the new Executive Council for the year 2025-26 under Dr Anurag Bajpai and Dr Ravindra Kumar. I also convey my thanks to Dr P Raghupati, Dr PSN Menon, Dr Ahila Ayyavoo, Dr Rakesh Kumar, and Dr Sirisha Kusuma for their help throughout the election process.

Regards, Dr Maheshwari

WELCOME NEW ISPAE MEMBERS

Life members	
• Ankita Goel, Noida • Tooba Qamar, Lucknow • Vivek Kumar Athwani, Sikar • Payal Choudhary, Delhi • Anu Tresa, Thoothukkudi • Lekshmi G, Kollam	• Remya Rajan, Vellore • Sangeeta Das, Cuttack • Meena Patel, Rewa • Veditha G, Bengaluru • Jasmine Kaur, Chandigarh
Associate members	
• Ezhilrekha Kumar, Vellore • Bhagadurshah Rameezraja, Chennai	• Parvesh Dalal, Rohtak •

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COPEPTIN- THE NEW BIOMARKER

Dhanya Soodhana Mohan, *Pediatric and Adolescent Endocrinologist, Aster MIMS, Calicut;* ***Tejasvi Sheshadri,*** *Pediatric and Adolescent Endocrinologist, Rainbow Children's Hospitals, Bangalore*

Copeptin is a fragment of vasopressin precursors produced by the paraventricular neurons of the hypothalamus and the supraoptic nucleus. It is a C-terminal 39-amino acid glycopeptide, stored in the secretory granules in the posterior pituitary and is released during various stimuli such as increase in osmolality and decrease in arterial blood volume and pressure.

It is challenging to quantify arginine vasopressin (AVP) due to its short plasma half-life of 5-20 minutes, considerable instability in plasma even when frozen, and high degree of platelet binding. Copeptin, on the other hand, is stable in serum for at least 7 days at room temperature and 14 days at 4°C; easy to measure, utilizing a variety of assays; with modest sample volume; in as little as 0.5-2.5 hours. It does not require any extra pre-analytical treatment. Because of its blood stability, swift and straightforward analysis, levels comparable to AVP levels, and ease of automation, it is a good substitute for AVP in endocrine disorders. Some studies have even reported that copeptin levels correlate more closely with plasma osmolality than AVP.

Different immunoassays exist to measure copeptin. The two certified assays are the sandwich immunoluminometric assay (LIA), and the automated immunofluorescent assay (on the KRYPTOR platform). Copeptin measured by these assays showed a good correlation over a wide range of levels (from very low to very high levels), but correlate poorly with enzyme-linked immunosorbent assays (ELISAs). ELISA assays also have poor diagnostic accuracy, especially in central diabetes insipidus (DI).

Clinical application in endocrinology: Copeptin has been assessed as a diagnostic biomarker for vasopressin-dependent disorders of fluid balance. Common disorders of body fluid homeostasis fall into two categories: hyperosmolar and hypoosmolar. Classical DI is a hyperosmolar condition, whereas syndrome of inappropriate antidiuretic hormone (SIADH) is the most prevalent hypoosmolar disorder (**Figure 1**).

1. Diabetes insipidus: It is important to differentiate between AVP resistance, AVP deficiency, and primary polydipsia, as their treatment differs; incorrect management could have dire consequences. The water deprivation test is the diagnostic gold standard for differentiating DI from its main differential diagnosis, primary polydipsia. Current methods utilized to assess post-operative DI (serum and urine sodium, and osmolality and fluid balance determination) have low sensitivity and specificity (<50%); while copeptin has been shown to be quite useful in the differential diagnosis of polyuria-polydipsia syndrome. Distinguishing partial central DI from primary polydipsia is very challenging. Two new copeptin-based test procedures with high diagnostic accuracy have been proposed to overcome these difficulties: the hypertonic saline stimulation test and the arginine stimulation test.
2. Syndrome of inappropriate antidiuretic hormone: Copeptin has also been proposed as a diagnostic marker in hyponatremia: the first prospective study of its role found no diagnostic utility of copeptin alone. Copeptin levels overlapped widely, so it could not be recommended as a diagnostic marker. However, the ratio of copeptin to urinary sodium helped to

discriminate between SIADH and conditions with decreased effective arterial blood volume.

An unstimulated, random copeptin cut-off of >21.4 pmol/L can diagnose AVP resistance with 100% sensitivity and specificity for diagnosis.

Stimulated copeptin of 4.9 pmol/L after hypertonic saline infusion differentiates central DI (CDI) and primary polydipsia with a high diagnostic accuracy of 97%, and is clearly superior to the classical water deprivation test. During an Arginine infusion test, 60 minutes after start of arginine infusion, values ≤3.8 pmol/L are diagnostic of CDI with a diagnostic accuracy of 93%.

Pituitary surgery: on the first postoperative day, stimulated copeptinvalues <2.5 pmol/L are suggestive of CDI, while values >30 pmol/L rule out CDI. Copeptin levels >84 pmol/L are indicative of hypovolemic hyponatremia, while very low levels (<3.9 pmol/L) are diagnostic for primary polydipsia.

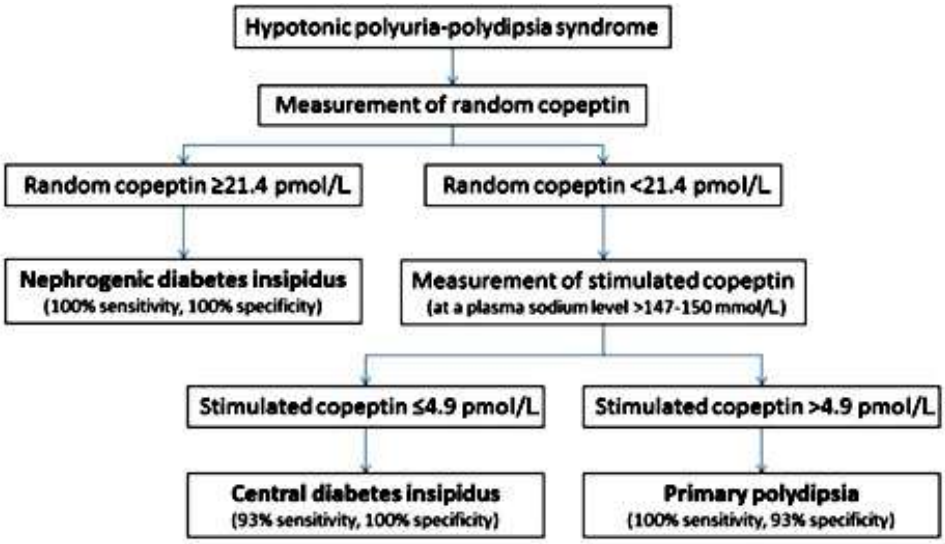

Figure 1: Diagnostic flowchart for the differential diagnosis of polyuria-polydipsia syndrome

Copeptin has been shown to be a prognostic biomarker in sepsis, pulmonary, cardiovascular, neurological, hepatic, and urinary diseases. In patients with heart failure, higher copeptin levels point to a more unfavorable outcome and increased mortality. Copeptin is used in Autosomal Dominant Polycystic Kidney Disease (ADPKD) as a marker predicting outcome and allowing early interventions.

To conclude, copeptin has demonstrated its role in distinguishing DI from primary polydipsia, and in the diagnosis of DI following pituitary surgery. It is necessary to determine suitable cut-offs in a larger cohort and in other groups.

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CONTROVERSIES IN FLUID MANAGEMENT IN DIABETIC KETOACIDOSIS

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Diabetic ketoacidosis (DKA) remains a preventable yet life-threatening complication of type 1 diabetes. Osmotic diuresis secondary to glycosuria causes significant volume depletion, triggering the renin-angiotensin-aldosterone system and exacerbating the release of counter-regulatory hormones, thereby perpetuating a vicious cycle. Additionally, the accumulation of hydrogen ions and ketones stimulates the chemoreceptor trigger zone, causing emesis and further dehydration.

Goals of fluid therapy: Fluid therapy is the cornerstone of DKA management, aiming to restore intravascular volume, improve tissue perfusion, and reduce hyperglycemia and acidosis. An ideal fluid should predictably expand the intravascular compartment, closely mimic plasma composition, and be metabolized or excreted without adverse effects. Rehydration alone has been shown to decrease glucose levels by 17-80% within 12-15 hours, averaging a reduction of 25-50 mg/hour.

Controversies in fluid therapy: The use of fluids in DKA has been a subject of extensive debate due to their potential association with cerebral edema. Over the past four decades, fluid management protocols have undergone numerous revisions, with variations in fluid type, volume, and rate of administration (see table).

Type of fluids- The choice between normal saline (NS) and balanced salt solution (BSS) as the ideal fluid of choice in DKA remains contentious. Traditionally, NS has been preferred for both volume resuscitation and deficit replacement. However, concerns over its high chloride content contributing to hyperchloremic acidosis and an increased risk of acute kidney injury (AKI) have necessitated a critical assessment of the 'normality' of 'normal' saline and challenged its widespread use. Randomized controlled trials (RCTs) in children with DKA (Yung *et al* and the SPinK trial) revealed no significant differences in the time to DKA resolution or incidence of AKI between NS and BSS. A recent meta-analysis of 11 RCTs (Liu *et al*) corroborated these findings, showing no difference in major adverse kidney events despite reduced chloride levels with BSS. Thus, the association between NS and the risk of AKI remains a subject of debate, warranting further RCTs. Recent pediatric guidelines permit the use of either NS or BSS in the management of DKA. Given the higher cost and limited availability of BSS in resource-limited settings, NS remains the practical choice until further robust evidence emerges.

Volume of fluids- Resuscitation/bolus volume- The indication and volume of fluid boluses remain debated. While some guidelines recommend boluses for all children with DKA, others restrict their use to cases with shock. Shock is uncommon in DKA due to the osmotic preservation of intravascular volume, and its presence should prompt evaluation for severe fluid deficits or sepsis. Management of hypotensive shock is well-established and is adherent to Pediatric Advanced Life Support (PALS) guidelines. However, it should be borne in mind that the requirement for boluses exceeding 20 mL/kg is rare in DKA. Although debated, children with poor perfusion despite normal blood pressure (compensated shock) may benefit from volume

expansion with one or two boluses of isotonic saline at 10 mL/kg, administered over 20-30 minutes each. In resource-limited settings with a high incidence of malnutrition, avoiding routine boluses in hemodynamically stable children with DKA may prevent rapid osmolar shifts and cerebral edema.

Deficit volume- Traditionally, children with DKA were presumed to have significant dehydration, with fluid deficits estimated between 10% and 15%. However, concerns over cerebral edema associated with aggressive fluid administration and rapid declines in serum osmolality have called into question the accuracy of these estimates. Clinical evaluation of dehydration in DKA is often challenging and less reliable compared to weight-based assessments, with conventional signs proving to be poor predictors of actual fluid deficits. Furthermore, severe acidosis does not consistently correlate with the severity of dehydration. Studies measuring body water content have revealed median absolute dehydration of 5.8-8.7%, indicating that the traditional 10% estimate was likely an overestimation. Based on these findings, recent guidelines have adjusted the assumed deficits to a range of 6.5-8.5%. In resource-limited settings, assuming the lower limit (6.5%) initially is prudent to minimize fluid volume in malnourished children.

Maintenance volume- With the exception of the BSPED 2015 guideline, most protocols calculate maintenance fluid volumes using the Holliday Segar formula. However, the question of whether bolus fluids administered for resuscitation should be deducted from the total fluid volume remains debatable. Earlier guidelines, including the recent ISPAD 2022 guideline, recommend subtracting all bolus fluids from the total calculated volume to prevent over hydration. Yet, with the current trend toward more conservative deficit estimates and the restricted use of boluses, this recommendation has become increasingly debated.

Rate of correction: The rate of fluid correction depends on factors such as initial glucose levels, severity of acidosis, osmolality, corrected sodium levels, renal function, and mental status. Slower correction is advised in cases of severe acidosis and high osmolality. The PECARN trial found no difference in incidence of cerebral edemaor time to DKA resolution between rapid and standard correction rates. However, a subsequent trial (Rewers *et al*) reported prolonged time to subcutaneous insulin initiation with faster correction rates. In resource limited settings, a slow and steady correction over 36-48 hours is preferred, considering the late presentation and severity of DKA in these settings.

In conclusion, although fluid therapy remains central to DKA management, definitive guidelines are lacking, with significant variability in recommended protocols. The optimal type, volume, and rate of fluid administration continue to be areas of active investigation. As evidence evolves, conservative strategies involving slow and gradual correction with isotonic fluids appear to be the safest approach in children with DKA, particularly in resource-limited settings.

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Table: Fluid management in different DKA protocols

Protocols	Milwaukee 1988	BSPED 2015	ISPAD 2018	BSPED 2020	ISPAD 2022	IAP NTG 2024
Bolus/resuscitation						
Type of fluid	NS or RL	NS	NS	NS	NS	NS
Volume						
Volume depletion	10-20 ml/kg over 1 hour; can be repeated	No bolus	10 ml/kg over 30-60 min	10 ml/kg over 60 min (in all who need IVF)	10-20 ml/kg over 20-30 min	No bolus
Impaired tissue perfusion		10 ml/kg	10 ml/kg over 15-30 min; may repeat		20 ml/kg over 20-30 min	
Hypotensive shock		10 ml/kg; repeat after discussion with consultant	20 ml/kg boluses as quickly as possible	20 ml/kg over 15 min. May repeat up to total 40 ml/kg	20 ml/kg boluses as quickly as possible	20 ml/kg over 20-30 min
Deficit replacement						
Deficit volume assumed based on severity of DKA	8.5% in all	5% in mild to moderate; 10% in severe	5-7% in moderate; 7-10% in severe	5% in mild, 7% in moderate, 10% in severe	5% in mild 7% in moderate 10% in severe	6.5% in mild to moderate 8.5% in severe
Duration of correction	23 hours	48 hours	24 – 48 hours	48 hours	24 – 48 hours	36 – 48 hours
Maintenance fluid						
Fluid to be started	N/2 saline	NS	NS or N/2 saline or BSS	NS or Plasmalyte	0.45-0.9% saline or BSS	NS or BSS
Calculation	Holliday-Segar formula	Reduced volume rules	Simplified Holliday-Segar formula	Holliday-Segar formula	Holliday-Segar formula	Holliday-Segar formula
Bolus subtraction from total fluid administered	All boluses subtracted	Boluses >20 ml/kg subtracted	Not mentioned	Only bolus given for volume depletion subtracted	All boluses subtracted	Only fluids administered pre-referral, if any, subtracted.

BSS balanced salt solution (Ringer's lactate, Hartmann's solution, Plasmalyte)

Holliday-Segar formula: *< 10kg: 2 ml/kg/h; 10-40 kg: 1 ml/kg/h; >40 kg: 40 ml/h*

Reduced volume rules: *≤ 10 kg: 100 ml/kg/24 h; 11-20 kg: 1000 ml + 50 ml/kg/24 h for each kg from 11-20; >20 kg: 1500 ml + 20 ml/kg/24 h + for each kg >20*

Simplified Holliday-Segar formula : *< 10 kg: 4 ml/kg/h; 11-20 kg 40 + 2 ml/kg/h for each kg between 11 and 20; >20 kg: 60 + 1 ml/kg/h for each kg >20.*

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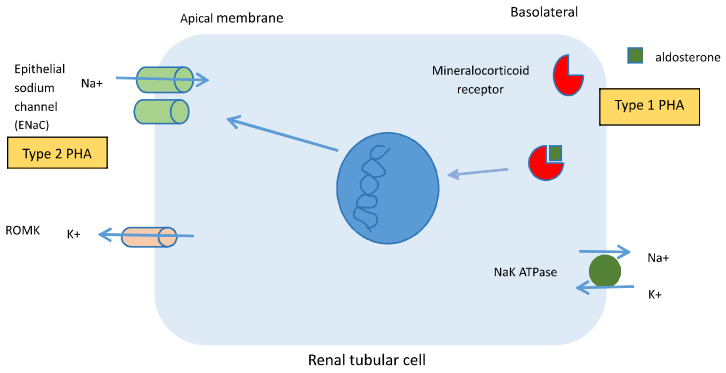
PSEUDOHYPOALDOSTERONISM- A MINI REVIEW

Arun Kumar M, *Fellow, Pediatric Endocrinology, Dept of Endocrinology, AIIMS Rishikesh, and* ***Aaradhana,*** *Professor, Dept of Pediatrics, UCMS & GTBH, Delhi*



Pseudohypoaldosteronism (PHA) is characterized by features of hypoaldosteronism with elevated aldosterone levels, indicating aldosterone resistance. It results from mutations of mineralocorticoid receptor, mutations of epithelial sodium channels or obstructive uropathies causing transient mineralocorticoid resistance. (Fig) Patients present in the neonatal period with dehydration, hyponatremia, hyperkalemia, metabolic acidosis, and failure to thrive despite normal glomerular filtration, normal renal and adrenal functions. When patients fail to respond to mineralocorticoid therapy, PHA is suspected as the underlying disorder. Lab findings include high plasma renin, high plasma and urinary aldosterone levels. The features of three types of PHA are tabulated in Table 1.

Table 1: Classification of pseudohypoaldosteronism

	Type I	Type II	Type III (secondary)
Inheritance	Autosomal dominant	Autosomal recessive	Acquired
Severity	Mild	Severe	Mild
Organs	Renal	Multi system (renal, skin, respiratory, salivary glands)	Renal (urinary tract and distal renal tubules)
Pathology	Inactivating mutations in mineralo-corticoid receptor (MR)	Mutations in amiloride-sensitive epithelial sodium channel (ENaC)	Obstructive uropathies, Drugs
Etiology	*NR3C2* gene mutation	*SCNN1A, SCNN1B* & *SCNN1G* genes mutation	Urinary tract infections Drugs
Treatment	Salt supplementation	Salt replacement, Potassium binders	Treat underlying cause. Stop offending drug
Prognosis	Good: remits with age	Poor: persists into adulthood	Good

Drugs causing secondary PHA

- ENaC blockers (amiloride, trimethoprim)
- Aldosterone antagonists (spironolactone)
- Others - cyclosporin A, tacrolimus.

Gordon syndrome: Some papers mention PHA type 2 as Gordon syndrome, though recent reviews state that Gordon syndrome is not a true form of PHA. These patients exhibit salt retention with mild hypertension and suppressed plasma renin activity rather than salt wasting. It is associated with pathogenic variants of the WNK1 and WNK4 genes, that result in activation of the thiazide-sensitive sodium chloride co-transporter in the cortical and medullary collecting ducts.

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DRUG CORNER

ANTIDIURETIC HORMONE (ADH) AND ITS ANALOGS

Rachna Keshwani, *Consultant Pediatric Endocrinologist, Jupiter Hospital, Surya Hospital, and Medicover Hospital, Mumbai*

Antidiuretic Hormone (ADH) or Vasopressin is a nona-peptide hormone with antidiuretic and vasoconstrictor properties. It is synthesized in the supraoptic and paraventricular nerve cell bodies in the hypothalamus as a pre-pro-hormone, packed into neurosecretory vesicles, and transported down the axons to nerve endings in the median eminence and posterior pituitary. During this axonal transport, the precursor molecule is cleaved to generate the final products: vasopressin, along with neurophysin II and the 39 amino acid C-terminal glycopeptide copeptin. All of them are secreted in equimolar concentrations from the posterior pituitary in response to physiologic stimuli, and thus serve as markers for ADH secretion. All mammals produce 8-arginine vasopressin (AVP); except porcine vasopressin, in which lysine is substituted for arginine in position 8. Desmopressin (dDAVP), the most common vasopressin analog in clinical practice, differs from AVP in that the terminal cysteine is deamidated and the arginine in position 8 is a D-isomer rather than an L-isomer: this is what gives it characteristic pharmacokinetic and pharmacodynamic properties.

AVP receptors are G protein coupled receptors. V1a receptors located on blood vessels mediate the vasoconstrictor-action of AVP. V2 receptors are high affinity receptors present on renal collecting duct epithelia; they increase insertion of aquaporin 2 channels in the luminal membrane, allowing water movement along its osmotic gradient into the hypertonic inner medullary interstitium from tubule lumen, and excretion of concentrated urine. V2 receptors also regulate AVP action to stimulate factor VIII and vWF production. A third receptor, V1B, is responsible for the non-traditional action of AVP to stimulate ACTH secretion.

Extracellular fluid tonicity is regulated almost exclusively by water intake and excretion, whereas extracellular volume is regulated by sodium intake and excretion. While vasopressin is the principal regulator of tonicity, the renin-angiotensin-aldosterone system is the main regulator of volume homeostasis, with some regulation by vasopressin and the natriuretic peptide family. The control of extracellular tonicity (osmolality) and volume within a narrow range is critical for normal cellular structure and function.

AVP has a short half-life of 5 minutes, and responds quickly to changes in hydration, the main stimulus for its release being increased tonicity, sensed by the osmoreceptors in the

hypothalamus. In addition to osmotic stimuli, AVP is also secreted in response to significant decreases in intravascular volume and pressure, via afferent baroreceptor pathways arising from the aortic arch, and volume receptor pathways in the cardiac atria and pulmonary veins.

AVP and its analogs in clinical practice

Diabetes insipidus (DI) in children manifests clinically as polyuria and polydipsia and results from ADH deficiency (central DI) or ADH insensitivity at the level of the kidney (nephrogenic DI). The antidiuretic action of AVP and its analogs is used for management of central DI. The V2-receptor-mediated actions are utilized for treatment of primary nocturnal enuresis, mild hemophilia A and type 1 von Willebrand disease. The management of vasodilatory shock/GI bleed make use of AVP's V1-receptor-mediated vasoconstrictor action. The use of AVP in most of these conditions is limited by its short half-life and lack of specificity for V1 and V2 receptors. The transient DI phase of triple phase response post CNS surgery is an exception, where the short half-life of IV vasopressin makes dose titration easier.

Desmopressin (dDAVP) is a synthetic analogue of AVP, 2000 times more specific for anti-diuresis than its naturally occurring hormone counterpart, with negligible vasoconstrictor properties and a longer half-life (55 minutes). It is available as oral tablets, oral lyophilisate for sublingual administration, intranasal solutionand a parenteral formulation. Bioavailability of intranasal route is 10-20%, with erraticabsorption; onset of action is 5-10 minutes, peak of action is at 1 hour, duration of action is 6-24 hours. The oral formulation has a bioavailability of 1-2% (hence dose is 10-15 times higher than the intranasal dose), onset of action is 15-30 minutes, peak of action is within 2 hours, duration of action is 8-12.5 hours and action is more predictable. The bioavailability of the oral lyophilizate tablet given sublingually is 60% higher than the tablet form. Parenteral administration of desmopressin is 5-20 times more potent than an intranasally administered dose ***(1 µg parenteral= 10 µg intranasal= 60 µg sublingual= 100 µg oral)***. *The equivalence of doses based on the different routes of administration is given in Table 1.* It is advisable to take the oral tablets 1 hour before to 2 hours after meals to prevent increased degradation by intestinal peptidases. Terlipressin, felypressin, ornipressin are V1 specific analogs of AVP (not discussed here).

Table 1: Formulations of AVP and its analogues for CDI treatment

Name of the drug	***Route of administration***	***Strength of formulation***	***Pediatric Dosages in CDI***
Desmopressin	Nasal spray	10 µg/0.1 mL (10 µg/puff)	Startingdose: 5-10 µg 1-2 times/day Adult dose: 20 µg 2 times/day
Desmopressin	Intranasal solution	0.1 mg/mL (0.01% w/v)	Same as above
Desmopressin	Oral	0.1/0.2 µg tablets	Starting dose: 0.05-0.1 µg 3 times/day (~10 µg/kg/day); Adult dose: 0.2 mg 3 times/day
Desmopressin lyophilisate	Sublingual oral melt	60/120/240 µg	60-120 µg 2 times/day
Desmopressin	Parenteral (SC)	4 µg/mL	1-2 µg 2 times/day
Synthetic aqueous Vasopressin	Intravenous/ Subcutaneous	20 units/mL	Start at 0.5 mIU/kg/hour iv infusion; Can go upto 10 mIU/kg/hour iv infusion (For vasodilatory shock/GI bleed dose is much higher: 0.1-2 mIU/kg/min iv infusion)

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EMPAGLIFLOZIN- EXPANDING THERAPEUTIC HORIZON

Medha Mittal, *Associate Professor, Dept of Pediatrics, Chacha Nehru Bal Chikitsalaya, Delhi*

Empagliflozin is a potent therapeutic agent that enhances glycemic control in type 2 diabetes mellitus through selective inhibition of sodium glucose co-transporter 2(SGLT2), located in the proximal tubule. The glycosuria is accompanied by natriuresis, which recovers after a few days due to compensatory increase in sodium (Na) absorption in the distal tubules, increased plasma renin activity, and reduction in natriuretic peptides. However, empagliflozin has direct effect on sodium channels (reduces expression of Na-K-2Cl co transporter and epithelial sodium channels (ENaC)) and reduces expression of water absorption channels aquaporin 2. It thus enhances urinary water excretion. There may be compensatory increase in arginine vasopressin but that does not blunt the overall effect of empagliflozin.

It is this aquaretic action of empagliflozin that has aroused enthusiasm for its possible use in syndrome of inappropriate ADH secretion (SIADH). In a RCT comparing empagliflozin (25 mg OD x 4 days) vs placebo in patients (n=88, age> 18 years) admitted with SIADH and serum(s) Na<130mEq/ml, empaglifloz in was effective in increasing the serum sodium (median rise of 10 mEq/ml vs 7 mEq/ml; p=.04) especially in those with low initial levels.[1] The effect was evident within 24 hours, increased after 48 hours and lasted for the 4-day trial period. Mild fluid restriction (less than 1000ml/ day) was common to both trial arms. With no significant untoward event, empaglifloz in proved to be a good therapeutic option. A further trial of its use for 4 weeks (double blind, placebo controlled, cross over trial) found it to be efficacious and well tolerated, with no event of hypoglycemia, hypotension, over-correction of sodium or acute kidney injury.[2] Overall, the efficacy is modest, with limited evidence base, and safety yet to be evaluated with tighter fluid restriction. The potential risk of over-correction of sodium and renal deterioration needs close monitoring.

Further studies are underway (such as SANDx and DIVE study) to evaluate its action in wider clinical settings before it can be recommended as a standard therapeutic option. At best it may be used as an adjunct to the current modalities of fluid restriction and second line agents, urea and tolvaptan (where applicable), in mild to moderate chronic euvolemic hyponatremia. Considering the limited efficacy of the current therapeutic options in SIADH, empagliflozin appears as a promising addition and pediatric trials may soon be forthcoming.

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DIAGNOSIS CORNER
*(*Please refer to CAPE News Sep-Oct 2024 reference)*

WATER DEPRIVATION TEST

Ruchi Shah, *Consultant Pediatric Endocrinologist, EndoKids, Ahmedabad*

A water deprivation test (WDT) is often helpful in establishing the diagnosis of Diabetes Insipidus (DI), and to differentiate between central and nephrogenic causes. The test is based on the principle that in normal individuals, water deprivation causes hypertonicity and volume contraction, which stimulates the release of Arginine Vasopressin (AVP) to reduce free water excretion in urine.

Indications: Confirmed polyuria and polydipsia (after excluding diabetes mellitus, hypercalciuria, renal disease and hypokalemia), but serum osmolality 270-300 mOsm/kg.

Precautions: This test is potentially life threatening, and should only be done in an institution with expertise in the field. It should not be done in newborns/very young infants, and in patients whose baseline Na is above 145 mmol/L. Alcohol should be avoided for at least 2 days prior to the test, as ethanol increases serum osmolality. Thyroid and adrenal reserve must be normal, or adequately replaced, and a written informed consent must be taken.

Procedure: The child should be admitted early morning after a maximally tolerated overnight fast. Some also advocate stopping fluid intake from midnight during sleep, but it is better to conduct during daytime. A secure intravenous line should be placed to allow fluid access. Baseline testing should include body weight, height and body surface area, vital signs; serum sodium, BUN, osmolality; blood glucose; and urine sodium, osmolality and specific gravity. With discontinuation of all fluids, and hourly monitoring of the following parameters should be done as in the chart below:

Monitoring chart

					SERUM			URINE				AVP
Time	PR	BP	Hydra-tion	Weight	Na	Osm	BUN	Volume	Na	Osm	Specific gravity	On termination
7 am	X	X	X	X	X	X	X	X	X	X	X	
8 am	X	X	X	X				X				
9 am	X	X	X	X				X				
10 am	X	X	X	X				X				
11 am	X	X	X	X	X	X		X		X	X	
12 noon	X	X	X	X				X				

Termination: The test is terminated when urine osmolality is consistently above 600 mOsm/kg for 2 readings (done one hour after the first reading), or above1000 mOsm at any point, serum osmolality above 300 mOsm/kg, sodium above 146 mmol/L**,** hypovolemia, or 5% weight loss has occurred. Patients with primary polydipsia may show weight loss earlier if they have had too much water before starting: the test need not be terminated early in these patients if vitals parameters are normal. Need to terminate the test usually takes 6-12 hours, depending upon severity. If the child is hemodynamically stable, the test can be continued till the target is achieved. At termination, collect samples for plasma AVP, serum Na, osmolality and BUN and urine osmolality, Na and specific gravity. If patient has not shown any urinary concentration during the test, proceed for DDAVP **(1-deamino-8-D-AVP)** challenge.

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DDAVPchallenge: Inj.DDAVP (20 units/ml) ***1 unit/m***^{2}is to be given subcutaneously with urinary osmolality checked at 30 and 60 minutes. Rehydration has to be slow, to avoid dilutional hyponatremia. Maximum double of the urine output during the test of fluids should be allowed within next 4 hours.

Interpretation: Increased urine osmolality suggests **primary polydipsia**. Increase in urine osmolality by more than two times after DDAVP suggests **central diabetes insipidus (CDI)**. Lower increase is suggestive of **nephrogenic diabetes insipidus (NDI)**. AVP level helps in differentiating partial CDI (low) from NDI (high). Patients with long standing primary polydipsia may have mild NDI, due to dilution of the renal medullary interstitium. This should not be confused with NDI, since these patients have a tendency for hyponatremia in the basal state.

WINNERS - CAPE News Sep-Oct 2024 Quiz

1) Dr PAMALI M. NANDA- Assistant Professor (Pediatrics), ESIC Medical College & Hospital, Faridabad
2) DR MOUMITA SAHA- Pediatric Endocrinologist, CMC, Vellore
3) DR SACHIN KRISHNA RAJ- Senior Resident, Department of Endocrinology, AIIMS, New Delhi

HYPONATREMIA

Ruchi Shah, *Consultant Pediatric Endocrinologist, Endo Kids, Ahmedabad*

Hyponatremia (serum Na <135 mEq/L) is among the most common electrolyte abnormalities in children, which in severe cases can lead to significant morbidity and mortality, especially in those with rapid changes in serum sodium. Etiology and treatment vary, based on severity [mild (130-134), moderate (120-129) and severe <120)] and duration [acute (<48 hours) and chronic (>48 hours)] of hyponatremia.

Initial assessment:

- Assess for possibility of loss of sodium (dehydration, renal sodium loss e.g. cerebral salt wasting or primary tubular disorder like Bartter or Gitelman syndromes or loss from skin e.g. cystic fibrosis)
- Oliguria/anuria (kidney function impairment)
- Excess water intake (primary polydipsia)
- Conditions causing Syndrome of Inappropriate Anti Diuretic Hormone(SIADH) *
- Hypervolemia (heart failure, nephrotic syndrome, cirrhosis).
- Differentiate from pseudohyponatremia due to increased osmoles like lipids, glucose(reduced by 1.6 mEq/L for every 100 mg/dL rise), mannitol, IVIg etc.
- Associated hyperkalemia points towards adrenal insufficiency or aldosterone deficiency.

Most conditions are identified during the initial evaluation.[1] Urine routine test, including specific gravity (SG), is an important test in initial evaluation; glycosuria and can be ruled out too. Urine SG rises by approximately 0.001 for every 35-40 mOsm/kg increase in urine osmolality[2]. Serum and urine osmolality should be done when hyponatremia is persistent and initial assessment does not

identify the cause. Urine sodium (UNa) and osmolality (UOsm) can help identify conditions associated with impaired water excretion (Una>20 mEq/L or UOsm>100 mOsm/kg) from those who are able to produce maximally dilute urine. In the absence of marked glycosuria or metabolic acidosis, UOsm can be calculated from the UNa, urine K and urea as well: Calculated UOsm = 2 (UNa + UK) + [Urine urea (mg/dL) ÷ 2.8]

SIADH and cerebral salt wasting (CSW)[4]: The criteria for defining SIADH are as below -

1. Hyponatremia (Plasma Sodium <135 meq/l)
2. Low plasma osmolality (<275 mOsm/kg)
3. Natriuresis (Urine sodium >20 meq/L)
4. Euvolemia (No clinical signs of volume depletion or edema)
5. Normal renal, cardiac, hepatic, adrenal and thyroid function.

The causes of SIADH in children include acute stressful conditions e.g. pain, stress, nausea, trauma, anesthesia; CNS tumors, infections, positive pressure mechanical ventilation, medications e.g. NSAIDs, carbamazepine, vincristine, cyclophosphamide, tricyclic antidepressants, narcotics, cisplatin etc.

CSW also presents with hyponatremia, hypoosmolality and natriuresis. The following features help to differentiate SIADH from CSW:

	SIADH	***CSW***
Volume status	Normal	Low
Polyuria	Absent	Present
Blood pressure	Normal	Low
Vasopressin level	Normal or high	Low
Treatment	Fluid restriction	Na, Fluids

Treatment: Depends on duration and severity of hyponatremia. It is important to remember that cerebral adaptation begins within 24 hours, so sodium correction has to be slow when hyponatremia duration is >24-48 hours, to avoid risk of osmotic demyelination. Children with severe hyponatremia presenting with severe symptoms typically require aggressive 3% saline replacement (3-5 mL/kg over 10-15 minutes), while mild to moderate hyponatremia with minimal symptoms often requires just treatment of the underlying cause and fluid management. In chronic hyponatremia, the rate of correction should not increase 4-6 mEq/L per day; 3% saline is rarely needed.

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HYPERKALEMIA

Richa Arora, *Consultant Pediatric Endocrinologist, Child Clinic & Endocrine Center, New Delhi*

Serum potassium values vary according to age, with hyperkalemia is defined as follows: preterm neonates > 6.5 mmol/L, term babies > 5.9 mmol/L, infants > 5.3 mmol/L and children> 5 mmol/L. Around 99% of potassium is intracellular and is released on cell lysis. Therefore, any reasons for hemolysis during sample collection and transport should be checked when high levels are seen. Hyperkalemia may result from increased intake through oral or intravenous route, parenteral nutrition, medications or massive transfusions. Increased cellular shift of potassium may occur in acidosis or channelopathy. Abnormal functioning of the renin angiotensin aldosterone system (RAAS), seen in chronic renal failure or endocrine disorders, can also lead to hyperkalemia.

Hyperkalemia is usually asymptomatic. ECG changes depend on the severity: at values of 5-5.6 mmol/L, tall T waves occur; values of 6-6.5 mmol/L are associated with wide QRS, ST elevation; and above 8 mmol/L, sine wave and ventricular fibrillation pattern are seen. Symptoms at advanced stages include weakness, syncope, palpitations or rarely cardiac arrest.

Management:

Hyperkalemia is a potentially life-threatening condition. Initial management precedes any diagnostic evaluation and begins with discontinuation of potassium infusion/ medications with potassium content. Urgency and type of intervention are based on the presence or absence of ECG findings. Measures include cardiac membrane stabilization (by intravenous calcium infusion), decreasing extracellular potassium levels by shifting extracellular potassium into cells (insulin therapy and inhaled beta-adrenergic agents), and reducing potassium stores. Removal of intracellular potassium can be done by diuretics, cation exchange resins and dialysis. Treatment of causes should be initiated, e.g. fluid repletion for renal failure due to hypovolemia, hormonal replacement for adrenal insufficiency, and correction of metabolic acidosis.

Work-up for etiology:

After the initial emergency management, a detailed history and examination should be performed. In patients with persistent hyperkalemia where other causes of elevated potassium have been ruled out, e.g. iatrogenic, errors during sample collection (excessive milking or hemolysis), renal failure, etc., plasma renin levels should be measured. Hyperkalemia should per se, inhibit renin excretion.

Renovascular disorders like renal artery stenosis are associated with a high renin level. Primary adrenal insufficiency (with mineralocorticoid deficiency) is also associated with elevated renin levels and low aldosterone. Normal cortisol in the presence of low aldosterone points to *CYP 11B2* defect that encodes the enzyme aldosterone synthase. Children with this disorder present with salt-wasting crisis, hypotension and poor growth.

Urinary potassium measurement can also help corroborate the underlying pathophysiological disease. Urinary potassium < 20 mmol/L is suggestive of impaired renal excretion; levels > 40 mmol/L suggest that the renal excretory mechanisms are intact and the excess urinary potassium is from increased production or decreased cellular uptake. Transtubular potassium gradient (TTKG) is calculated by measuring serum potassium, urinary potassium excretion, and concurrent serum and urine osmolarity. The formula is, TTKG = (urine potassium x serum osmolarity)/ (serum potassium x urine osmolarity). In the setting of hyperkalemia, TTKG should be high (>10) to

account for renal clearance of potassium. If itis <8, it suggests a defect in the RAAS pathway like aldosterone deficiency or inadequate action. However, this measurement may be considered valid only if there is adequate urine concentrating mechanism (osmolarity) and adequate urinary sodium concentration.

A combination of hyponatremia and hyperkalemia suggests salt-wasting crisis!

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CASE REPORT

WHEN SALT BECOMES THE VILLAIN: A CASE REPORT

Nida Shaikh, Vani HN, Raghupathy P; *Dept of Pediatric Endocrinology, Indira Gandhi Institute of Child Health, Bengaluru*

Hyponatremia is a common electrolyte imbalance and is associated with significant morbidity and mortality. A 10-year-old boy presented with history of nausea, vomiting and headache for the past 2 weeks. He had polyuria (urine output 5.6 ml/kg/hr). At age 2 years, he was diagnosed with aqueductal stenosis and congenital hydrocephalus, for which he underwent endoscopic third ventriculostomy. At age 8years, he underwent ventriculo-peritoneal shunt surgery.

On examination: he appeared dehydrated, with sunken eyes and poor skin turgor. His laboratory reports showed serum sodium122meq/L, serum potassium 4.3 meq/L, serum osmolality 272mOsm/kg,urine sodium 197mEq/L and urine osmolality 690mOsm/kg. The thyroid profile and 8am serum cortisol were normal. The possibilities of cerebral salt wasting (CSW) and syndrome of inappropriate antidiuretic hormone secretion (SIADH) were considered. It is important to differentiate CSW from SIADH as the management of both conditions differs significantly. CSW was diagnosed in this child as he had hyponatremia with polyuria. Hyponatremia was treated with the administration of hypertonic saline and tab fludrocortisone @100mcg/day. The serum sodium levels normalised to 134-136meq/L within three days.

CSW is triggered by CNS insults like intracranial surgery, intracranial hemorrhage, meningitis, encephalitis or head injury.[1] In response to hypovolemia, atrial natriuretic peptide and brain natriuretic peptide are released, which promote sodium excretion. A proximal tubular natriuretic compound called haptoglobin-related protein without signal peptide (HPRWSP) has been described, which exerts a direct inhibitory effect on sodium and urate reabsorption that accentuates hyponatremia and hypovolaemia.[2]

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LEARNING PEARLS

29TH ISPAE ACES MEETING: MC CUNE ALBRIGHT SYNDROME

***Experts: Prof Alison Boyde, C**hief Metabolic Bone Unit, Lasker Clinical Research Scholar, NIH/NIDCR, Bethesda; **Dr Shalmi Mehta,** Endokids Clinic, Ahmedabad, **Dr Leenatha Reddy, R**ainbow Children's Hospital, Hyderabad*

*(Compiled by **Zalak Upadhyay**, Pediatric & Adolescent Endocrinologist, Endocare for Kids, Rajkot)*

The 29thISPAE ACES meeting, conducted on 14th September 2024, 7-9 pm, with the topic **McCune-Albright syndrome (MAS),** was successful: we would like to thank the case presenters, Dr Akshatha A and Dr Praveen Paul, the Moderators and the Speakers for their contribution.

LEARNING PEARLS:

- Treatment of peripheral precocious puberty (PPP) in boys in MAS involves combination of testosterone blocker and aromatase inhibitor. Bicalutamide + letrozole can be used.
- Letrozole is preferred for treatment of PPP in girls. It is metabolized faster in children; hence 2.5 mg OD should be given.
- Fertility is not an issue in females with MAS, but they may ovulate less frequently.
- For recurrent ovarian cysts later in life, progesterone containing IUDs are preferable to OC pills, thus avoiding the estrogen component.
- Regardless of growth velocity, annual measurement of serum IGF 1 is recommended to rule out GH excess.
- Bony deformities may require surgical correction: indications include pain with weight bearing, deformity that impairs gait, femoral neck shaft angle < 110° or > 150°. Intermedullary rods are preferred as surgical techniques.
- In MAS with fibrous dysplasia (FD), low phosphorus is a poor prognostic marker.
- FGF 23 levels are high and usually correspond to the level of severity of FD.
- Burosumab is being tried in low-phosphorus FGF-related FD.
- Bisphosphonate treatment does not change the histology or histomorphometry of FD lesions. The current evidence suggests IV bisphosphonates only for pain relief in FD. The lowest dose and longest interval for bisphophonates should be used.
- Denosumab does reduce the activity of FD lesions but improves pain and physical function. Severe post-discontinuation hypercalcemia was seen in a subset of patients after using denosumab.
- Lifespan is usually normal. Osteosarcoma or scoliosis of the spine causing pulmonary complications can cause mortality.

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PEDIATRIC ENDOCRINOLOGY FELLOWS QUIZ 2024

The preliminary round of the **Pediatric Endocrinology Quiz** was held on 30 Nov, 2024 online through Zoom Quiz, with quizmaster Dr Akanksha Parikh. Four of the 10 teams which participated, were selected for finals: Team PGI, Chandigarh: Drs Sayan & Arun; Team AIIMS, New Delhi: Drs Konpal & Sukanya; Team Jehangir Hospital, Pune: Drs Sushil & Nimisha; and Team CDER, Kanpur: Drs Alapan & Sandeep.

The final round was held online on 14 Dec 2024, with quiz expert **Dr M Vijayakumar,** and quizmasters Drs Aashima Dabas, Aayush Gupta, Akanksha Parikh, Sirisha K and Zalak Upadhyay. There were six rounds including one rapid fire round. All four teams competed well. Team AIIMS, New Delhi (Drs Sukanya & Konpal) won the first prize, while PGI, Chandigarh (Drs Arun & Sayan) were awarded the first runner-up. Dr Vijaya Kumar joined the ISPAE OB (Drs Ahila Ayyavoo, Rakesh Kumar and Sirisha K Boddu) in congratulating all the participants and the winners for their brilliant participation.

IDEAL/ BEST/ IDEAS Reports

ISPAD ENDORSEMENT - BEST - IDEAS - THE YEAR SO FAR!

Anju Virmani, *Director, Pediatric Endocrinology, Max Smart Super Specialty Hospital, & Senior Consultant Endocrinologist, Madhukar Rainbow Children's Hospital, New Delhi;* ***Sirisha K Boddu,*** *Senior Consultant Pediatric Endocrinologist, Rainbow Children's Hospitals, Hyderabad;* ***Preeti Singh,*** *Professor, Lady Hardinge Medical College & Kalawati Saran Children's Hospitals, Delhi*

IDEAL: Expanding Its Horizons

IDEAL recently achieved a significant milestone by receiving endorsement of ISPAD (International Society for Pediatric and Adolescent Diabetes) and successfully completed eight batches of pediatric diabetes (PD) educators. As it looks to the future, IDEAL is all set to launch its 9thbatch in January 2025, exclusively designed for physicians. Addressing specific knowledge gaps identified in early-career pediatric endocrinologists, alongside IDEAL 9, a parallel, less exacting course 'IDEAL-lite' is being introduced, to provide comprehensive training in PD education. IDEAL has attracted considerable attention from neighbouring countries facing a shortage of PD education resources, and continues to receive applications from abroad, reflecting the program's high quality and global recognition. The possibility of collaborations is being explored. The IDEALites WhatsApp group remains a vibrant platform, fostering discussions and advocacy efforts. Earlier in the year, action by IDEALites resulted in CBSE issuing a letter formalizing the permissions given by NCPCR in 2023 enabling all students with T1D appearing in board exams, to carry diabetes technology (pumps, sensors) and other self-care material like glucometer, glucose, snacks, into the exam halls. Another collective initiative was a letter written to Government authorities, urging a

reduction in GST rates on life-saving diabetes supplies: syringes, pen needles, glucose testing strips, and particularly continuous glucose monitoring systems, with hopes for impactful outcomes.

IDEAS: Transforming Diabetes Education in Indian Schools Through Multilingual and Digital Outreach

Through the IDEAL platform, IDEAS (Initiative for Diabetes Education & Awareness for Schools) has steadily expanded diabetes awareness across India to ensure accessibility and inclusivity. Over the past two years, ISPAE has developed and available on its website, comprehensive school-related materials, including slides providing clear information about diabetes care in schools for teachers and other staff. Recognizing the need for linguistic diversity to maximize outreach, IDEAS has started creating video recordings of these diabetes care presentations in not just English, but also Hindi, Gujarati, Tamil and Telegu, with multiple other Indian languages in the pipeline. These resources are hosted on the IDEAS YouTube channel, allowing parents to share them with teachers at crucial times, such as at the time of a child's diagnosis and at the start of each new academic year. This innovative approach ensures that diabetes education is available nationwide without the limitations of traditional workshops or in-person sessions. By leveraging digital platforms, IDEAS is overcoming geographic and language barriers to reach remote areas where expert resources are scarce. This effort underscores a commitment to making diabetes education widely accessible, free, and effective for underserved populations.

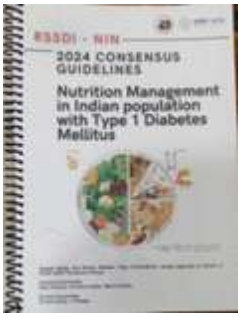
BEST: A Comprehensive Education Series for Type 1 Diabetes Empowerment in India

The Basic Education Series on Type 1 Diabetes (BEST), an offshoot of IDEAL, has drawn upon the expertise of its dedicated faculty to complete eight batches by the end of 2024. With applications for the 9thbatch set to open soon, the program continues to serve as a valuable platform for deepening understanding of T1D among persons living with T1D (PwD), care givers, and diabetes educators who see fewer PwD. They gain critical insights and become part of a supportive community. The sustained success of BEST highlights the growing demand for accessible and practical diabetes education in India. By empowering participants with knowledge and skills, BEST is fostering healthier, more informed lives, while building a robust support network for PwD.

GUIDELINES RELEASE

RSSDI-NIN GUIDELINES FOR NUTRITION MANAGEMENT IN INDIAN POPULATION WITH TYPE 1 DIABETES

Anju Virmani, *Director, Pediatric Endocrinology, Max Smart Super Specialty Hospital, & Senior Consultant Endocrinologist, Madhukar Rainbow Children's Hospital, New Delhi;* ***Sheryl Salis,*** *Founder and Director, Nurture Health Solutions*



Medical Nutrition Therapy (MNT) is one the three pillars for managing type 1 diabetes (T1D), along with basal-bolus insulin replacement, and self-monitoring of blood glucose (SMBG) whether by glucometer of continuous glucose monitoring (CGM), supported by diabetes education. There are several myths and fallacies not only in the minds of families regarding MNT, but health care professionals (HCP) as well, causing needless medical and psychosocial problems. In children and adolescents with T1D,MNT is more crucial, to ensure normal growth and physical and emotional development. The HCP must make

sure the person with T1D and the entire family consume a normal, balanced diet, without imposing blanket restrictions, placing emphasis on locally available, less processed foods, factoring in individual, cultural and regional preferences and food insecurity, if present.

An experienced diabetes care team may not be available everywhere, so nutritional guidance may have to be given by a physician/ dietician/ diabetes educator not familiar with T1D management. These comprehensive yet simple **RSSDI-NIN Guidelines** have been prepared keeping this in mind, and factoring in the vast diversity of regional and cultural eating habits in India. They were released at the **Annual RSSDI conference** in **Yashobhoomi, Delhi,** on **15th Nov 2024**, by Dr Jitendra Singh (Minister of Science & Technology and Earth Sciences), Dr Peter Schwarz (President of the International Diabetes Federation), Prof. Azad Khan (Regional Chair, South East Asia) and the Governing Body of RSSDI. They will be published as a supplement in the **January 2025** issue of **IJDDC** (Indian Journal of Diabetes in Developing Countries), after which they will be available on the **RSSDI website**.

The Guidelines are the first of its kind, and will be useful for all of us looking after T1D. They will actually be worth sharing with everyone (not just families with T1D), because of the emphasis on the principles of balanced, nutrient-dense diet, ensuring tasty yet healthy food. Following these guidelines can thus help not only someone with T1D, but anyone, of any age, better manage diabetes or even prevent it.

ACTIVITIES by ISPAE MEMBERS

PEDICON DAKSHIN 2024-Practical Pediatric Endocrinology Workshop

Dr Deepa Anirudhan, Dr Dhanya Soodhana

A one-day workshop on Pediatric Endocrinology held at Government Medical College, Thrissur on 25th Oct, 2024 as part of the Dakshin Pedicon 2024 conducted by IAP Thrissur, was attended by 34 delegates. Basic topics (DKA- what is new?, growth charts, bone age estimation, rickets, puberty, thyroid disorders and case based discussions on atypical genitalia) were covered. The chief guest Dr Asokan, Principal, GMC Thrissur inaugurated the workshop. The faculty included Drs Ahila Ayyavoo, Vijayakumar, Riaz, Reetha G, Parvathy L, Deepa Anirudhan, Rajesh TV, Veena Nair, Pavithra Nagaraj, Sowmya Kurup, Nithya and Dhanya.

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HARMONIZING HORMONES- A PEDIATRIC ENDOCRINOLOGY UPDATE 2024

Dr Diksha Shirodkar, Assistant Professor (Pediatrics), Pediatric Endocrinologist, Yenepoya Medical College and Hospital, Mangalore

A Pediatric Endocrinology & Diabetes Workshop & CME was conducted at Kanachur Institute of Medical Sciences, Mangalore on 23-24 November. The diabetes workshop on 23rdNov, which included talks on special circumstances in diabetes, sick day management, and management of DKA, had a huge response of 99 registrations: students, interns, post graduates in pediatrics and internal medicine, and general pediatricians. Didactic talks were followed by a hands-on workshop of growth chart plotting and interpretation and another one T1D: management, insulin administration & titration, insulin delivery devices, and continuous glucose monitoring systems. Faculty were Drs Diksha Shirodkar, Koushik Urala and Supreetha Shetty.

The CME on 24th Nov conducted by Drs Shaila Bhattacharyya, Pavithra Nagaraj, Diksha Shirodkar, Supreetha Shetty and Koushik Urala, had an overwhelming 155 registrations. The topics included childhood obesity, short stature, ambiguous genitalia, precocious puberty, congenital and acquired hypothyroidism. This memorable program created awareness among pediatricians and postgraduate students.

6th WORLD PEDIATRIC CONFERENCE 2024, OSAKA,JAPAN

Dr Priti Hemant Phatale, Samrat Endocrine Institute, Aurangabad

Dr Priti was invited as a speaker on 18 Oct 2024on practical case-based approach on common pediatric health problems like difficult pneumonia, fever with rash, and an update on 'Breaking the Cycle: Addressing Malnutrition across Generations in India'& Initiatives taken by Government of India to improve child health.

TYPE 1 DIABETES AWARENESS PROGRAM & LAUNCH OF T1D CARE STRENGTHENING PROJECT

Dr Aashish Sethi, Pediatric Endocrinologist, Dehradun, Uttarakhand

The UDAI Annual Health Camp, held on 23rdNov 2024 at Sai Institute, Dehradun, was a heartfelt initiative aimed at supporting children living with T1D. It was attended by numerous "diabuddies" and their parents, making it a truly memorable day filled with both health-focused and recreational activities. The objectives were to (a) conduct comprehensive annual screening for children with T1D, including HbA1c and thyroid tests, critical for effective diabetes management and early detection of complications; and (b) create an engaging and supportive environment through fun activities and games, encouraging participation and spreading awareness, and educate attendees on the latest advancements in diabetes technology and thyroid management.

The camp was supported by Medtronic: representatives from Medtronic and Abbott shared valuable insights into advancements in diabetes and thyroid care. Dr Aashish provided specialized guidance, inspiring everyone with his dedication. Sai Institute, under the leadership of its Chairman and Director, extended unwavering logistical and infrastructural support. The event was organized under the banner of UDAI Diabetes Awareness Initiative Society, reflecting its ongoing commitment to the well-being of children with T1D. The collaborative effort brought meaningful health interventions, valuable education, and joy to all participants, advancing the mission of UDAI to foster a better quality of life for children with T1D.

TYPE 1 DIABETES AWARENESS PROGRAM &LAUNCH OF T1D CARE STRENGTHENING PROJECT

Ms Rekha Negi, Founder, UDAI Diabetes Awareness Initiative, Uttarakhand

National Health Mission (NHM) Uttarakhand, in collaboration with the William J. Clinton Foundation (WJCF), organized a landmark event in Dehradun on 11th Dec2024: the launch of the T1D Care Strengthening Project, an initiative by WJCF in partnership with NHM Uttarakhand. It aims to enhance care and services for persons with T1D in Uttarakhand. The objectives of the event and the Project include emphasizing the need to strengthen services and care for T1D, developing and implementing a Basic Care Package, and enhancing access and delivery of T1D services, to ensure children, adolescents, and young adults can lead healthy and productive lives.

During the meeting, I shared my journey of living with T1D: the challenges faced during the undiagnosed phase, the difficulties post-diagnosis, and my transformative role in the community. Currently, I am actively supporting over 400 children living with T1D in Uttarakhand, raising awareness, offering guidance, and advocating for improved care. My heartfelt story and impactful community work added a personal dimension to the discussions, emphasizing the urgent need for increased awareness, support, and resources for T1D. Doctors from Kerala shared insights about the *Mittayi* Project, a T1D-specific care initiative. Learnings and insights shared by doctors from other states provided valuable perspectives on innovative strategies and best practices in T1D management. A panel discussion, with Dr Aashish Sethi, deliberated on implementation strategies for the four pillars of the Basic Care Package, factoring in these inputs, with emphasis on the importance of basal-bolus therapy.

The launch of the T1D Care Strengthening Project, with collaborative efforts of NHM Uttarakhand and WJCF, combined with invaluable contributions of experts, practitioners, and community leaders, is a promising step toward transforming T1D care in Uttarakhand, aiming to ensure no child is left behind due to a lack of resources or understanding.

WORLD DIABETES DAY CELEBRATION ENDOCARE FOR KIDS CLINIC

Dr Zalak Upadhyay, Consultant Pediatric Endocrinologist, Rajkot, Gujarat

WDD was celebrated on 8 Dec 2024 at the BT Savani Kidney Hospital Auditorium, supported by the **Juvenile Diabetes Foundation, Rajkot,** attended by 88 children with T1D and their parents**.** 50 strips and 50 pen needles were gifted to the children, and urine microalbuminuria and urine protein /creatinine ratio were tested in all the children. A talk by Dr Zalak Upadhyay on latest

technologies in managing T1D, was followed by a talk by Pediatric Nephrologist Dr Mahipal Khandelwal on diabetic nephropathy and its prevention, and the launching of 15 new recipes by Dietitian and Diabetes Educator Ms Zalak Vaghasia. These were all healthy, nutritious, home-made, low-carbohydrate recipes to be eaten as snacks without needing insulin cover. Mothers were awarded prizes for the 3 best healthy, nutritious and home made recipes in a recipe competition held 1 week prior. Children did a Zumba dance as stage performance. Delicious, freshly prepared, healthy lunch was served at the end: besan chila with vegetables, vegetable khichdi, curd and salad.

WORLD DIABETES DAY CELEBRATION - IGICH, BENGALURU

Dr Lekshmi.G, Endocrinology Fellow, Dr Vani HN, Prof Raghupathy P

WDD celebration was organized at IGICH, Bengaluru on 16th Nov2024in association with CDiC (Changing Diabetes in Children-Novo Nordisk): around 130 kids and their parents participated. The day got rolling with a walkathon around the campus, in which all the T1Dchildrenparticipated actively. Dr Vani HN started the program with a welcome speech, after which the function was inaugurated by Director, Dr Sanjay KS and senior consultant Dr Raghupathy P. Dietician Ms Rachitha Avinash discussed balanced and healthy meal plans. Cultural performances by the children and a drawing competition added a lively and creative touch to the event. Ms Lavanya Prasad kept the audience hooked with her story telling which was motivating at the same time. Clinical Psychologist from NIMHANS conducted a discussion on resilience and coping strategies for the children, addressing parental concerns as well. All children received free insulin and gifts, followed by a healthy and delicious lunch, and concluded with prize distribution for best glycemic control and best performances of the day. The event successfully raised awareness, fostered a sense of community, and celebrated the resilience and achievements of children living with T1D.

WORLD DIABETES DAY CELEBRATION - APOLLO CHILDREN'S HOSPITAL, CHENNAI

Dr V Soundaram, Consultant Pediatric Endocrinologist

On 13thNov 2024, the Chennai Pediatric Endocrinology & Diabetes Foundation, in collaboration with Apollo Children's Hospital, organized a vibrant WDD program at Apollo Children's Hospital, Thousand Lights, Chennai. The event spotlighted the alarming rise in type 2 diabetes In children and adolescents, and promoted awareness about prevention and healthy lifestyle practices.

The day kicked off with an engaging lineup of activities and health talks. Nursing college students performed thought-provoking mimes that captured the audience's attention. Dr Soundaram gave an insightful talk “Being Chubby Is Not Healthy”, shedding light on the health risks associated with childhood obesity. This was followed by an informative session on “Healthy Ways to Lose Weight” by dietitian Ms Sanjula, offering practical tips for sustainable weight management.

One of the key highlights was the live food demonstration by the Food and Beverage team, showcasing innovative, tasty, and healthy recipes that delighted young taste buds, proving that nutritious food can be both fun and delicious. In addition to the educational talks and

demonstrations, health screening was conducted for all children attending the OPD. The screening included measurement of height, weight, body mass index (BMI), body composition analysis, and blood sugar levels. To emphasize the importance of physical activity, children enthusiastically participated in Zumba sessions and enjoyed various fun games designed to promote fitness. An exercise cycle challenge saw children pedalling on an elliptical from 10 am to 5 pm, demonstrating their commitment to staying active. The program also included a poster and quiz competition for nurses, which fostered learning and creativity. This dynamic event blended education and entertainment, making it a memorable day for all attendees. Through innovative activities, health screenings, engaging talks, and hands-on demonstrations, children and families were inspired to adopt healthier lifestyles and combat the growing threat of childhood type 2 diabetes.

WORLD DIABETES DAY CELEBRATIONS- CGM and PUMP WORKSHOP

Dr Meena Kumari Mohan, Pediatric Endocrinologist, PSG Super Specialty Hospitals, Coimbatore

A support group activity conducted for children and families with T1D on 30th June 2024 was attended by about 75 participants from 30 families, who were addressed by a T1D advocate from T1DFoundation. The importance of insulin and managing hypoglycemia on a day-to-day basis were discussed. A motivational talk by psychologist D Radhakrishnan was followed by a discussion reinforcing managing T1D and the importance of CGMS in monitoring, irrespective of whether on a pump or MDI.

A pump workshop held on 23rd Nov 2024 was attended by 25 children and families who are using insulin pump. A specific example of a teenager using 780G insulin pump, who had a recent episode of DKA, was discussed, to educate families that DKA can happen even on a 780G pump, if pump alarms are ignored, thus emphasizing the importance of responding to pump alarms and of regular clinic follow ups.

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WORLD DIABETES DAY 2024 CELEBRATIONS - BENGALURU

Dr Tejasvi Sheshadri, Consultant Pediatric & Adolescent Endocrinologist, Rainbow Children's Hospitals, Bangalore; & RL Jalappa Diabetes & Endocrine Centre for Children, Kolar

Saturday, 23rdNov witnessed WDD 2024 celebrations organized by the Dept of Pediatric Endocrinology at Rainbow Children's Hospitals, Bangalore. Pediatric endocrinologists Dr Poornima RN and Dr Tejasvi Sheshadri inaugurated the event. Attended by children with T1D and their parents, doctors, dieticians, and nurses, the event was a fun-filled affair with magic show, interactive games, talent contest and much more. Every year WDD celebrations remindus that by coming together as a group, we can create a world where diabetes does not dictate our lives.

WDD 2024 was celebrated on Nov 14that RL Jalappa Diabetes Centre for Children, Kolar, attended by 35 children with T1D and their caregivers. A walkathon to raise awareness about childhood diabetes, was followed by a cultural event, with children showcasing their talent such as singing, dancing and painting, followed by interactive group games. It ended with a motivational speech by a successful adult T1D.

WORLD DIABETES DAY CELEBRATIONS - MAULANA AZAD MEDICAL COLLEGE, NEW DELHI

Ms Nandini Nanda, Clinical Dietitian, and Dr Aashima Dabas, Professor (Pediatrics), MAMC

The Dept of Pediatrics at MAMC celebrated WDD on 18thNov 2024, with the aim of uniting for a healthier tomorrow. Focusing on raising awareness about T1D management and promoting wellness, the event featured sessions on diabetes care, nutritional counseling, portion control and recipes, a yoga session, along with fun educational activities and interactive games on correct food choices. Children were distributed rubber balls to ensure physical activity at home. The event was attended by children with T1D, their families, students, residents, and faculty members, fostering a comprehensive approach to diabetes care. A key learning point was the importance of integrating nutrition, exercise, and education in T1D management, empowering families and children to make informed decisions about diet, lifestyle, and self-care.

YOG DHYAN FOUNDATION QUARTERLY REPORT (OCT-DEC 2024)

Dr Anil Vedwal, Chief Functionary, YDF

***October 2024*:** The HbA1c Camp on 6th Oct for over 200 children and accompanying 150 parents and volunteers, had games, educational sessions, and a party for those meeting their health goals. Esteemed guests joined us: **Mr Prashanth Mani** (Tamil Nadu T1D Foundation),

Mr Lakshminarayana Varimadugu (Sweet Souls, Hyderabad), **Mr Kamlesh Chitte** (Udaan, Aurangabad), **Ms Deeksha Dev** (Diabesties), and **Dr Krishnan Swaminathan** (Idhayangal Charitable Trust, Coimbatore). Special thanks to the **Bigger Picture Foundation** (BPF) for committing nutritious meals for YDF monthly camps and to **Healthians Lab**, for discounted, accurate and timely tests. The monthly Zoom webinar on 13th Oct celebrated *The Power of Unity*, with T1D Hero **Dr Shruti Arora**, speaker **Mr Harsh Kohli**, and panelists **Ms Rekha Negi** and **Ms Vaishali Vakil.**

November 2024: celebrated talent and advocacy on 15thNov when, on **Dr Meena Chhabra's** invitation, YDF children presented a dance and skipping performance choreographed by **Ms Ishana** at the **52 RSSDI Annual Conference & IDF Southeast Asia Diabetes Congress at Yashobhoomi, Delhi**. They earned a heartfelt commendation from **Dr Peter Schwartz**, President, International Diabetes Federation, who called them "unstoppable."On 24thNov, **WDD** was celebrated at the Kailash Colony center with yoga, diabetes education session and distribution of diabetes supplies; special gifts for the RSSDI performers from **Ms Bindiya Chhabra**, Vice President, YDF; and the inspiring success story of **Ms Bhumika Khurana**, former YDF beneficiary, now a finance professional and Diabetes Educator.**Rotary Southend Delhi** generously donated CGM devices worth Rs 1.5 lakh. The special monthly Zoom webinar on 17 Nov celebrated *The Power of Diabetes Education & Advocacy*, with T1D Hero & speaker **Dr Preeti Singh**, and panelists **Mr Lakshminarayana V**, **Ms Varsha Dhananjay Mane**, and **Dr Anju Virmani.**

December 2024: The 1stDec camp featured special guest **Ms Shweta Jain (**Nutritionist, Diabetes Educator) who praised the camp as fun and educational; **Ms Vani** (BPF) sponsoring a delightful meal and donating a CGM sensor to a child in need; and **Ms Shaili Mehra** (YDF alumnus)leading the birthday celebrations with muffins in her mother's honor. The monthly zoom webinar on 8thDec celebrated *The Power of Sharing*, with T1D Hero& speaker **Ms Aruna Sharma**, and panelists **Mr Jeetesh Wadhwa**, **Ms Jhanavi Thareja**, **Mr Sanjay**, and **Ms Himani.**

WORLD DIABETES DAY CELEBRATION - RAINBOW CHILDREN'S HOSPITAL, CHENNAI

Dr Swathi Padmanaban, Consultant Pediatric & Adolescent Endocrinologist

Rainbow Children's Hospital, Chennai, hosted WDD 2024 on Sunday, 8thDec 2024. Centered around the theme *Diabetes and Wellbeing*, the event aimed to raise awareness about diabetes care, emphasizing the importance of managing the condition in a holistic manner. It provided a platform for children, families, and medical professionals to come together, form a supportive community, share experiences, and learn from one another, celebrating the resilience and strength of families navigating life with diabetes. The day reinforced the importance of not only medical management but also emotional and community support in improving the quality of life for children

living with diabetes. There were a series of fun activities for children, along with informative sessions by leading experts. Notable speakers included Ms Beemajan Yousuf, Vice-Chairperson, T1D Foundation of India, and Ms. Rogini Arunindra Kumar, Certified Diabetes Educator, providing valuable insights on living with diabetes. Dr Swathi Padmanaban delivered a key presentation, highlighting the importance of managing diabetes beyond just blood sugar control. Speaking about recent advancements in diabetes treatment and the crucial role of early detection and prevention of T1D, her session focused on how early intervention can lead to better long-term outcomes for young patients. Rainbow Children's Hospital remains dedicated to empowering families through education and support.

WORLD DIABETES DAY - KARNATAKA INSTITUTE OF ENDOCRINOLOGY & RESEARCH, BENGALURU

Ms Shilpa C Parihar and Ms Cynthiyal T, Dietitian and Diabetes Educator, Dr Santhosh Olety

The event organized at Karnataka Institute of Endocrinology and Research (KIER), aimed to create a platform for sharing knowledge, empowering and networking among families with T1D to improve overall psychological wellbeing and quality of life of the child and families by creating a strong support system. Fun-filled team-building games, talent show with singing, mimicry, Bharatanatyam, hip-hop and yoga, knowledge and experience sharing, meeting adults with childhood onset T1D, ended with thanking the donors/sponsors and having a healthy lunch. Almost 100 kids and their families took part in the event. With right support from family, encouragement and knowledge from healthcare professionals, our kids can thrive and achieve anything they set their minds to. “Together we are stronger, Together we are unstoppable”.

WORLD DIABETES DAY CELEBRATIONS - CHACHA NEHRU BAL CHIKITSALAYA, DELHI

Dr Medha Mittal, Associate Professor, Pediatrics

WDD celebrations at CNBC, organised by Dr Medha Mittal, began with screening of the movie 'The Perfect Sugars' by Dr Bhanu Bhakri, which was very much enjoyed by all, sans the popcorn and cola. There was dance performance by a child with T1D;other children shared their experiences of managing diabetes; the inaugural address by Director Dr Seema Kapoor; an interactive session by Dr Anuja Agarwala on 'Optimizing Diet in T1D', followed by a panel discussion on insulin administration and blood glucose control. The panelists included Dr Aaradhana, Dr Preeti Singh and Dr Ravindra Kumar. Parents of more than 80 children attended and actively participated.

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BEATING DIABETES - WE ARE TOGETHER (online)

Dr Richa Arora, Consultant Pediatric Endocrinologist, New Delhi

It was a get-together online activity for children with T1D conducted on 15 Nov 2024. We discussed technology forT1D, with special emphasis on continuous glucose monitoring. A few kids shared their poems, and many parents shared their experiences to motivate each other. Mr Harsh Kohli also motivated the kids to live with enthusiasm and determination and not let diabetes interfere in attaining any goal. An important message emerged at the end of this session “We can be each other's strength”.

WORLD DIABETES DAY CELEBRATIONS- PUBLIC AWARENESS (online)

Dr Meena Kumari Mohan, Pediatric Endocrinologist, PSG Super Specialty Hospitals, Coimbatore

Dr Meena Mohan conducted an online meeting with a motivational talk by Mr Lakhsminarayana Varimadugu on 29th Sep 2024 for children with T1Dand their families. Lakshmi spoke on his life and how he manages T1D and blindness, and still is be able to be so positive and help many people in many ways. It was well received by 50 attendees, turning very emotional at the end, with several take-home messages to carry from him. To conclude, “Where there is a will, there is a way”.

TRAINEES' SECTION

MERRY QUIZMAS!

Tejasvi Sheshadri, Consultant Pediatric and Adolescent Endocrinologist, Rainbow Children's Hospitals, Bengaluru

Please answer the questions below on Water and electrolyte disturbances. Correct answers and individual quiz scores will be mailed to the respective email address after the quiz closes.

https://forms.gle/9d198o9skVwYtBwe9

“LAST DATE 7thJanuary 2025”

ISPAE 2025

Nagpur

9th Biennial Meeting of

Indian Society for Pediatric and Adolescent Endocrinology (ISPAE)

14th to 16th November 2025 | Nagpur

ISPAE PET Fellows School

11th - 14th November 2025 | Nagpur

In Association with APPES, ESPE & ISPAD

APPES ESPE ISPAD

ispae2025@gmail.com | www.ispae2025.com

REGISTRATION DETAILS

Type	Early Bird Upto 15th Jan 2025	Regular Upto 31st May 2025	Late Upto 5th Nov 2025	Spot Registration
ISPAE Members	Rs. 8,500	Rs. 12,000	Rs. 14,000	Rs. 16,000
Non Members	Rs. 9,500	Rs. 14,000	Rs. 16,000	Rs. 18,000
Student* / Accompanying Person	Rs. 4,500	Rs. 6,000	Rs. 7,000	Rs. 7,000
International Delegates	US $ 200			

ISPAE PET Fellows School

Registration Fees: Rs. 12,000

Registration fees inclusive of 18% GST

Dr. Ahila Ayyavoo
Organizing Chairperson

Dr. Hari Mangtani
Organizing Secretary

Dr. Vaman Khadilkar
Scientific Committee Chair

Dr. Nikhil Lohiya
Joint Organizing Secretary

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LAST DATE FOR EARLY BIRD REGISTRATION
15th JANUARY, 2025