The incidence and diagnostic factors of polydipsia and polyuria: a single center survey in Japan

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Introduction and aim

Polydipsia and polyuria are one of the common chief complaints in the field of pediatric endocrinology. The differential diagnosis of polydipsia and polyuria are various diseases including diabetes mellitus (DM), central diabetes insipidus (CDI), and primary polydipsia (PP). DM is not difficult to diagnose, however, between DI and PP is sometimes difficult to diagnose. Although many examinations including a water deprivation test or hypertonic saline infusion test are needed to distinguish between CDI and PP, they are not convenient.

The objective of our study is to reveal the incidence of CDI and PP, and to investigate predictive factors for differentiation between CDI and PP.

Methods

This study was a retrospective chart review, performed from January 2014 to December 2018 in Department of pediatrics, Kurume University Hospital in Japan. The chief complaints of the patients, whose age was from 0 to 15 years old, were polydipsia and polyuria.

Variables analyzed including age, sex, symptom duration, height, BMI, drinking volume, urine volume and several biochemical tests.

Results

Subjects

From January 2014 to December 2018
First visit patients
in the department of endocrinology of pediatrics, Kurume University Hospital
n=1611

Exclusion:
1) A chief complaint is not polydipsia and polyuria.
2) Patients diagnosed with diseases causing of polydipsia and polyuria previously.
3) Patients treated for polydipsia and polyuria.
n=1584

Patients with polydipsia, polyuria and both
n=27

Exclusion:
Hyperglycemia, Urine sugar positive
Type 1 diabetes mellitus (T1DM)
n=16

- Central diabetes insipidus (CDI) n=5
- Primary polydipsia (PP) n=5
- Noctural enuresis n=1

In our study, patients with hypercalcemia, hypercalciuria, hypokalemia and nephrogenic diabetes insipidus were not present

Biochemical tests※

	CDI (n=5)	PP (n=5)	*P*
Serum Na (mEq/L)	142.4 ± 4.15	140.0 ± 1.58	0.26
Hb (g/dL)	12.3 ± 1.7	13.9 ± 0.4	0.10
Alb (g/dL)	4.27 ± 0.44	4.69 ± 0.34	0.13
BUN (mg/dL)	11.82 ± 3.72	9.88 ± 1.14	0.31
Cr (mg/dL)	0.42 ± 0.23	0.35 ± 0.09	0.55
Serum osmolality (mOsm/kg)	296.2 ± 17.29	301.8 ± 45.4	0.80
Urine osmolality (mOsm/kg)	135.5 ± 35.0	430.4 ± 306.6	0.09
AVP (pg/ml)	0.50 ± 0.14	2.62 ± 2.31	0.10
Urine specific gravity (early morning)※※	**1.005 ± 0.002**	**1.015 ± 0.004**	**0.004**

※ Date of first visit examination except for Urine specific gravity
※※Without water deprivation
Significant at $p<0.05$

Patient Clinical Characteristics

	CDI (n=5)	PP (n=5)	*P*
Age (years)	7.8 ± 5.08	9.51 ± 3.90	0.54
Sex	M=2,F=3	M=3,F=2	1.00
Symptom duration (months)	26.4 ± 35.2	23.8 ± 33.75	0.9
Height (SD)	-1.46 ± 1.01	-0.39 ± 0.52	0.06
BMI (SD)	**-0.75 ± 1.18**	**1.01 ± 0.27**	**0.02**
Urination and drinking during bedtime	4※	3	-

※One patient is difficult to evaluate for infant .
Significant at $p<0.05$

Drinking and Urine volume for 24 hours

	CDI (n=9)	PP (n=7)	*p*
Drinking (ml/m^2)	**3628 ± 850**	**1900 ± 529**	**0.0006**
Urine (ml/m^2)	**3707 ± 1278**	**1364 ± 881**	**0.001**

Significant at $p<0.05$

MRI

	Age (years)	Posterior pituitary bright spot (T1WI)	Other MRI findings	Diagnosis
PP1	4	Present	—	
PP2	8	Present	—	
PP3	10	Present	—	
PP4	11	Not implemented		
PP5	12	**Absent**	—	
CDI1	0.3	**Absent**	—	Aftereffect of Neonatal meningitis
CDI2	5	**Absent**	**Pituitary Cyst**	Xanthogranuloma of the sellar region
CDI3	8	**Absent**	**Pituitary gland enlargement, stalk thickening**	germinoma
CDI4	11	**Absent**	**Pituitary stalk thickening**	Idiopathic?
CDI5	12	**Absent**	**Pituitary stalk thickening**	IgG4-related hypophysitis

Significant at $p<0.05$

Conclusion

✓ 11 patients (0.6% of first visit patients) with a chief complaint of polydipsia and polyuria in the absence of hyperglycemia, 5 CDI patients (0.4% of first visit patients) were identified. Moreover, in our medical region (Chikugo region), the incidence of T1DM was 2.2 per 100,000 population, and the incidence of CDI was 0.7 per 100,000 population of children. Hence, the incidence of CDI is low. To our knowledge, this study is the first to investigate the incidence of CDI in Japan.

✓ BMI and Urine Specific gravity were significantly lower in CDI than PP. Urine osmolality tended to be lower in CDI than in PP , however, not significantly. It may be due to small sample sizes. Moreover, the amount of drinking and urine volume was significantly higher in CDI than in PP. In MRI, posterior pituitary bright spot showed absence with all 5 CDI. These characteristics can help to distinguish between CDI and PP.

Reference

1) Haddad NG, et al. Endocr Pract. 2016 2) Dabrowski E, et al. Best Pract Res Clin Endocrinol Metab. 2016 3) Babiker AM, et al. J Trop Pediatr. 2015

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