

Urine Osmolality in The Elderly

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ABSTRACT

Aim: investigation was done in the institutionalized elderly in order to know the value of urine osmolality in this population.

Methods: cross sectional study was done in the government institutionalized elderly that localized in South Jakarta. By using simple random sampling, 50 elderly people were chosen from all of the residents in this institutionalized elderly aged more than 60 years. They were excluded if they had diabetes mellitus, abnormal cortisol (reference range of morning cortisol, 5–25 ug/dL), potassium less than 3 meq/L, chronic diarrhoe, congestive heart failure, nephrotic syndrome, and cirrhosis of the liver, and also if they were in manitol or diuretic treatment, and not cooperative. All of these data were analyzed with descriptive analysis and comparative T-test of two non-related groups.

Results: there were 28 elderly peoples consisted of 13 males and 15 females participated in this study. The mean of the urine osmolality was 581 ± 174 mosmol/Kg. The mean of the urine osmolality in the female group (657.33 ± 126.54 mosmol/kg) was significantly higher than in the male group ($p = 0.01$).

Conclusion: the urine osmolality in the elderly is high and the so-called normal value is 407-755 mosmol/Kg. Further study is needed to investigate the lowest urine osmolality value as the diagnostic tool of hyponatremia due to water excretion disorder in the elderly.

Key words: urine osmolality, elderly, ADH.

INTRODUCTION

Measuring the osmolality is one ways to assess solute concentration. In case of hyponatremia, the etiology of hyponatremia could be determined by measuring the serum and urine osmolality. Accordingly, in etiology diagnostic of polyuria such as diabetes insipidus and primary polydipsia or hypernatremia, it is beneficial to measure the urine osmolality.¹

In normovolemia and normonatremia status, the value of urine osmolality is similar to the serum osmolality which is around 275-290 mosmol/Kg. But in hypovolemic status the value of urine osmolality is more than 450 mosmol/Kg. The increasing of urine osmolality due to the increasing of ADH (antidiuretic hormone) was stimulated by hypovolemia condition.¹⁻⁴ It is different in Primary Polydipsia, excessive water intake will depress the secretion of ADH by hypothalamus, then the urine osmolality will be lower than 100 mosmol/Kg.⁵ The value of ADH in the elderly increases more than the value of ADH in younger than 60 years old and the increasing of this ADH is independent of the value of serum osmolality.⁶⁻⁸ High ADH's value in the elderly will raise the reabsorption of water at the collecting duct and therefore the urine osmolality will be increased. Urine osmolality could also be used as a sign of secretion of ADH by the hypothalamus.¹ In term of the autonomic increasing of ADH in the elderly, it will also change the level of urine osmolality that is common in the elderly or so-called normal in the elderly group. The changes of the so-called normal urine osmolality in the elderly will also change the level of urine osmolality for diagnosing of hypovolemic condition, primary polydipsia or other conditions that need the urine osmolality as a diagnostic tool.

Investigation was done in the institutionalized elderly in order to know the so-called normal value of urine osmolality in this population.

METHODS

Cross sectional study was done in the government institutionalized elderly that localized in South Jakarta. This study is the part of the primary study of Optimal Water Intake in The Elderly for prevention of hyponatremia.⁶ By using simple random sampling, 50 elderly people were chosen from all of the residents in this institutionalized elderly whose age were more than 60 years old. They were included if their age more than 60 years old, their volume status were normovolemia, and the creatinine serum less than 2 mg/dL. They were excluded if they had diabetes mellitus, abnormal cortisol (reference range of morning cortisol, 5–25 ug/dL), potassium less than 3 meq/L, chronic diarrhoe, congestive heart failure, nephrotic syndrome, and cirrhosis of the liver, and also if they were in manitol or diuretic treatment, and not cooperative. On the day of the study, urine osmolality, spot-urine sodium, ADH serum, NT-proBNP serum, BUN, and creatinine were examined. All of these data were analyzed with descriptive analysis and comparative test of two non-related groups.

RESULTS

Through the included and excluded criteria and selection for extreme ADH (2 persons) and extreme urine osmolality (1 person), there remained 28 elderly people, 13 males and 15 females participating in this study.

The mean of the urine osmolality in all of 28 elderly peoples was 581±174 mosmol/Kg. (**Figure 1**). The mean of the urine osmolality in the male group was 493.3±183.96 mosmol/Kg and in the female group was 657.33±126.54 mosmol/Kg. The mean of the urine osmolality in the female group was significantly higher than in the male group (p= 0.01). (**Tabel 1**)

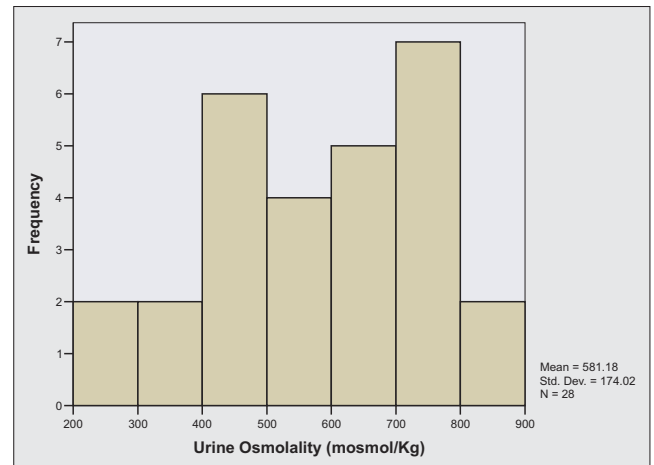


Figure 1. Frequency distribution of the urine osmolality in the elderly

The mean ratio of BUN: Kreatinin in these elderly people was 14.07±3.61. The median of the serum ADH in the all of elderly people was 11.1 (8-24.4) pg/mL, in the male group was 14.8 (7.6-21.7) pg/mL, and in the female group was 10.95 (8.9-16.3) pg/mL. There was no significant difference of the serum ADH value between the male and the female groups. (**Tabel 1**)

The mean of the value of the spot urine sodium in male group was 117±51.64 meq/L, but in the female group was 171.53±37.01 meq/L. The spot urine sodium value in female group was significantly higher than in the male group (p=0.003). (**Tabel 1**)

There was no significant difference of the NT-proBNP value between the male group (374.02±283.02 pg/mL) and the female group (256.73±143.55 pg/mL). (**Tabel 1**)

DISCUSSION

In this study, on the normovolemia (BUN: Creatinine ratio less than 20) and normonatremia status, the urine osmolality was high (581±174 mosmol/Kg), compared with the general people at the same status (275-290 mosmol/Kg). The higher value of the urine osmolality in the elderly people could be due to the high serum ADH value. It could be regarded that the serum ADH value in this study of the normovolemia and normonatremia status was high (11.1 pg/mL), compared with the serum ADH in the general people (0 pg/mL) at the same status.²

Looking at this different value, it could be predicted that using the value of the urine osmolality as a tool of diagnostic etiology of hyponatremia is different between the elderly and the general people. In general people, the value of the urine osmolality is 100-300 mosmol/Kg

Tabel 1. The value of the urine osmolality, ADH, spot urine sodium, and NT-proBNP of the elderly people

Lab. Tests	Male (n = 13)	Female (n = 15)	All of the elderly
Urine Osmolality (mosmol/Kg)	493.3 ± 183.96	657.33 ± 126.54	581 ± 174
ADH (pg/mL) (median, IQR)	14.8 (7.6-21.7)	10.95 (8.9-16.3)	11.1 (8-24.4)
Spot Urine Sodium (meq/L)	117 ± 51.64	171.53 ± 37.01	
NT-proBNP (pg/MI)	374.02 ± 283.02	256.73 ± 143.55	

IQR = Interquartil Range

in hyponatremia due to water excretion disorder and the urine osmolality value will be less than 100 mosmol/Kg if the etiology of hyponatremia is primary polydipsia. Due to the higher value of ADH in the elderly people, water excretion should be deteriorating. In the other study, it was reported that the water intake more than 1500 ml/day could cause hyponatremia in the elderly.⁶ If the mean urine osmolality of the elderly is 581 ± 174 mosmol/Kg, the range of this mean is between 407 mosmol/Kg and 755 mosmol/Kg in normonatremic and normovolemic status. Excessive water intake could be regarded as the etiology of hyponatremia if the value of urine osmolality less than 407 mosmol/Kg in the elderly.

In terms of gender, the urine osmolality and the spot urine sodium value in the elderly female group were significantly higher, but there were no significant difference in the serum ADH and NT-proBNP. Other investigators found that the value of NT-proBNP in the female was higher than in the male.⁹ This discrepancy could be due to the small sample size in this study. It needs sample size of 20 for NT-proBNP descriptive study.⁶ The higher value of the urine osmolality in the female group in this study could be due to the the higher value of the spot urine sodium value. In fact, the value of NT-proBNP was higher in the female.⁹ It could be regarded that the higher value of the spot sodium urine in the female group in our study was due to the higher value of NT-proBNP in general.

CONCLUSION

Urine osmolality in the elderly is high and the so-called normal value is 407-755 mosmol/Kg. Further study is suggested for investigating the lowest urine osmolality value as the diagnostic tool of hyponatremia due to water excretion disorder in the elderly.

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