

## DYSELECTROLYTEMIA IN ELDERLY: A HOSPITAL BASED STUDY

Tanushree Maitra<sup>1</sup>, Riturag Thakuria<sup>2</sup>, Atanu Basumatary<sup>3</sup>

<sup>1</sup>Registrar, Department of Medicine, Silchar Medical College and Hospital, Silchar, Assam, India.

<sup>2</sup>Assistant Professor, Department of Medicine, Silchar Medical College and Hospital, Silchar, Assam, India.

<sup>3</sup>Post Graduate Trainee, Department of Medicine, Silchar Medical College and Hospital, Silchar, Assam, India.

### ABSTRACT

#### INTRODUCTION

Dyselectrolytemia is a common problem affecting elderly hospitalised patients. Although hypo/hyponatremia is the most common electrolyte abnormality found in elderly, abnormalities in other electrolytes may also occur in various settings. Information regarding the pattern of electrolyte abnormalities in elderly is lacking in this part of the country. With this background the following case control study was taken up with the following aims and objectives.

#### OBJECTIVES

To study the various patterns of dyselectrolytemia in elderly and compare them with young.

To evaluate and compare the various aetiological factors and comorbid conditions involved in the occurrence of electrolyte abnormalities in these groups of patients.

#### RESULTS

The mean age of the study population was 66.174 years (SD- 6.512 years) and of the control group was 41.94 years (SD - 10.924 years). Hyponatraemia was the most common electrolyte abnormality encountered in both the groups (57% vs. 60%, p- 0.61). The incidence of hyperkalaemia was significantly higher in the older age group (19.5% vs. 11.5%, p-0.03). Also, in the elderly, the presence of abnormalities in more than one electrolyte level was significantly higher than the young (25.5% vs. 14%, p -0.005). The average length of hospital stay in the elderly was 10.05 days (SD- 4.40 days) whereas in the young was 6.35 days (SD- 3.27 days), p <0.0001. The mortality rate was also significantly higher in the elderly group (16% vs. 3.5%, p<0.0001).

#### CONCLUSION

Dyselectrolytemia is a common pathological condition encountered in the elderly population which is associated with a very high morbidity and mortality when compared with the young. Hence, elderly patients particularly with associated comorbid conditions should be screened routinely for the presence of associated electrolyte disturbances.

#### KEYWORDS

Dyselectrolytemia, Elderly, Hyponatraemia, Hyperkalaemia.

**HOW TO CITE THIS ARTICLE:** Maitra T, Thakuria R, Basumatary A. Dyselectrolytemia in elderly: A hospital based study. J. Evid. Based Med. Healthc. 2016; 3(30), 1348-1351. DOI: 10.18410/jebmh/2016/308

**INTRODUCTION:** The demography of the world has changed rapidly in the recent years. In almost every country, the elderly population has been growing rapidly over the past few decades, with improvements in health care, resulting in longer life expectancy.<sup>(1)</sup> As with any other age group, health problems in elderly are diverse. One of such common problems affecting the elderly group is abnormalities in water and electrolyte balance. Age is an independent risk factor for the occurrence of dyselectrolytemia. Ageing is associated with impaired physiological reserve and a reduced ability to compensate for fluctuations in environmental conditions.

*Financial or Other, Competing Interest: None.  
Submission 16-03-2016, Peer Review 30-03-2016,  
Acceptance 06-04-2016, Published 14-04-2016.*

*Corresponding Author:*

*Dr. Riturag Thakuria,*

*Assistant Professor, Department of Medicine,  
Silchar Medical College and Hospital, Ghungoor,  
Silchar – 788014, India.*

*E-mail: rituragthakuria@gmail.com*

*DOI: 10.18410/jebmh/2016/308*

These changes include changes in cardiac and renal reserve, making the elderly more vulnerable to the changes in water and electrolyte gain or loss with a resulting increase in morbidity and mortality. Moreover, elderly people are often treated with multiple medications which could also affect their fluid balance. Although dysnatraemia is the most common electrolyte abnormality found in elderly, abnormalities in other electrolytes may also occur in various settings.<sup>(2)</sup>

Prevalence of hyponatraemia varies from 1-50% in various studies and is to the extent of 11% in hospitalised geriatric patients and 5.3% in geriatric outpatients. Hyponatraemia is found in 1% of patients greater than 60 years old admitted to the hospital.<sup>(3,4)</sup> Hyper/hypokalaemia is present in about 1-10% of elderly hospitalised patients. Abnormalities in calcium and magnesium levels are also more common in the elderly when compared with the young, but they are not much studied in clinical trials.

Information regarding prevalence and pattern of electrolyte abnormalities in elderly is lacking in this part of

the country. With this background, this study was taken up with the following aims and objectives.

- To study the various patterns of dyselectrolytemia in elderly and compare them with young.
- To evaluate and compare the various aetiological factors and comorbid conditions involved in the occurrence of electrolyte abnormalities in these groups of patients.

**MATERIALS AND METHODS:** The study was a case control study conducted in the Department of Medicine, Silchar Medical College and Hospital for a period of 6 months from July to December 2015. The study protocol was approved by the Institute's Ethical Committee. A total of 400 patients i.e. 200 cases (patients above 60 years) and 200 controls (patients below 60 years) were included in the study. All patients were evaluated with a detailed history and physical examination and relevant investigations including estimation of electrolytes ( $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Ca}^{++}$  and  $\text{Mg}^{++}$ ) were done.

Hyponatraemia was defined as a plasma  $\text{Na}^+$  concentration of  $<135$  mmol/L and hypernatraemia as  $\text{Na}^+$  levels  $>145$  mmol/L. Hypokalaemia as  $\text{K}^+$  level  $<3.5$  mmol/L and hyperkalaemia as  $\text{K}^+$   $>5.5$  mmol/L. Hypocalcaemia was considered when corrected  $\text{Ca}^{++}$  was  $<8.5$  mg/dL and hypercalcaemia when  $\text{Ca}^{++}$  was  $>10.2$  mg/dL. Magnesium levels  $<1.7$  mg/dL and  $>2.2$  mg/dL were used in defining hypo and hypermagnesaemia respectively.

Microsoft Excel and SPSS software packages were used for data entry and analysis. Fisher's exact t test was applied to find the significance of difference between two proportions. A P value of less than 0.05 was accepted as indicating statistical significance.

**OBSERVATIONS:** The mean age of the study population was 66.174 years (SD- 6.512 years), and of the control group was 41.94 years (SD - 10.924 years) (table 1). Males contributed 59% of the study population and 72% of the control group (table 2). Hyponatraemia was the most common electrolyte abnormality encountered in 57% of the patients in the study group and 60% patients in the control group ( $p=0.61$ ). Hypernatraemia was present in 6% of the cases and 3.5% in the controls ( $p=0.34$ ). The presence of hypokalaemia was higher in the younger population (13.5% vs. 19%,  $p=0.17$ ) whereas the presence of hyperkalaemia was significantly high among elderly (19.5% vs. 11.5%,  $p=0.03$ ). Hypocalcaemia was also significantly higher in the elderly (12.5% vs. 5.5%  $p=0.02$ ). The presence of hypercalcaemia, hyper/hypomagnesaemia was 1.5% vs. 0.5% and 2% vs. 1% among the cases and controls respectively. Presence of combined electrolyte disturbances i.e. abnormalities in more than one electrolyte levels was also significantly higher in the elderly population (25.5% vs. 14%,  $p=0.005$ ) (table 4).

The most common comorbid conditions encountered in the elderly were hypertension (41%), diabetes (33.5%), CKD (22.5%), acute illness (19%) and cerebrovascular accident (18%) whereas in patients below 60 years the common comorbidities were acute illness (36%) followed by

acute gastroenteritis and hypertension in 24% patients each, and diabetes and chronic liver disease in 18% patients (table 3). In 67% of the cases and 34% of the controls, history revealed the presence of at least one drug which could contribute to the development of electrolyte disturbance. Most common of these drugs were diuretics followed by other antihypertensives and antidepressant medications. In 39% of the cases and 18% of controls more than one comorbid factor was present ( $p<0.0001$ ). Also, dietary restriction of sodium was a factor more commonly encountered in the elderly group (23.5% vs. 9%,  $p=0.0001$ ).

The average length of hospital stay in the elderly was 10.05 days (SD- 4.40 days) whereas in the young was 6.35 days (SD- 3.27 days),  $p<0.0001$  (table 5). The mortality rate was also significantly higher in the elderly group (16% vs. 3.5%,  $p<0.0001$ ) (Table 6).

**DISCUSSION:** The study was conducted in the Dept. Of Medicine, Silchar Medical College and Hospital to evaluate the various patterns of dyselectrolytemia among the patients admitted in the medicine ward of the college and also to determine the variation in the pattern of electrolyte abnormalities, aetiology and associated comorbid conditions prevailing in the elderly and the young.

Males outnumbered females in both the study and the control group, 59% and 72% of the cases in the study and control group respectively; however, the percentage of females in the elderly group was significantly higher than in the young (41% vs 28%,  $p=0.008$ ). This is in conjunction with the various reports which showed that chronic hyponatraemia is more common among postmenopausal females. 60% of the cases in a prospective study on hyponatraemia by Clayton et al were females.<sup>(5,6,7)</sup>

Although hyponatraemia was the most common electrolyte disturbance in both the groups, our results did not show any significant difference in prevalence between elderly and young. This is in contrast to various reports that shows that the prevalence of hyponatraemia increases in elderly frail patient groups owing to factors like degenerate physiology, multiple comorbid conditions and polypharmacy.<sup>(8,9)</sup>

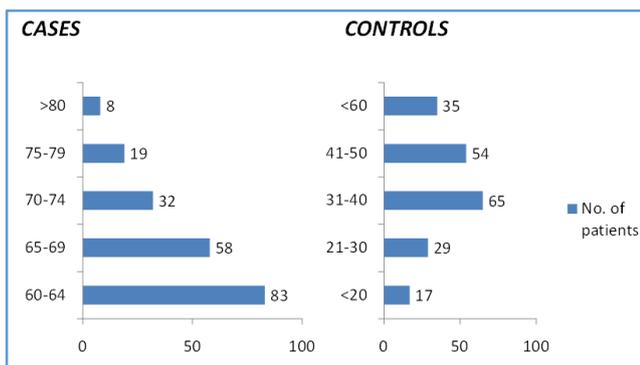
In our study, the prevalence of hyperkalaemia was found to be significantly higher among the elderly. This may be due to the increased prevalence of chronic kidney disease among elderly. Also with age, the transtubular potassium gradient decreases.<sup>(10)</sup> The decrease in the serum levels of renin and aldosterone coupled with drugs may also contribute to the increased prevalence of hyperkalaemia among older individuals.<sup>(11)</sup>

The prevalence of hypocalcaemia was also significantly higher among elderly. This may be due to declining renal function and vitamin D deficiency, both of which tend to increase with age.<sup>(12,13)</sup>

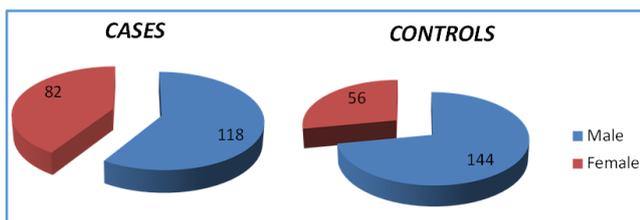
Also elderly patients had a significant higher prevalence of abnormalities in more than one electrolyte levels, 25.5% vs. 14% in the young. This is probably due to the effect of ageing in the various physiologic process, multiple comorbidities and polypharmacy.

The average length of hospital stay and mortality were also significantly higher in the elderly group. Many studies have revealed mortality rates ranging from 33%-86% among elderly patients with severe hyponatraemia.<sup>(14)</sup>

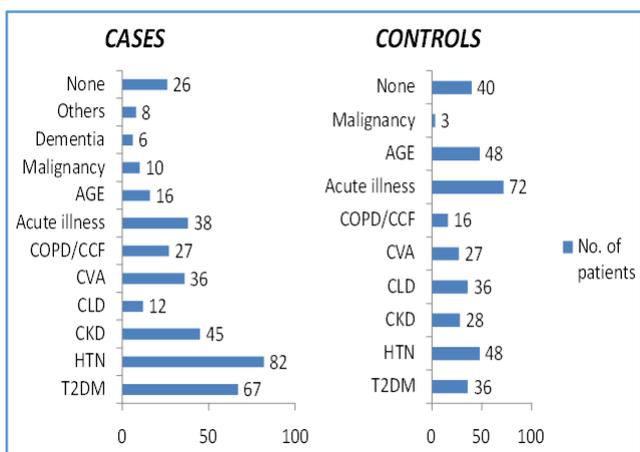
**SUMMARY AND CONCLUSION:** Dyselectrolytemia is a common pathological condition encountered in the elderly population which is associated with a very high morbidity and mortality when compared with the young. Although hyponatraemia is the most common electrolyte abnormality encountered, elderly patients also have a greater propensity to develop abnormalities in more than one electrolyte. Hence, elderly patients particularly with associated comorbid conditions should be screened routinely for the presence of electrolyte disturbances. Moreover, larger studies with greater number of patients is required to throw more light on the exact pattern of electrolyte abnormalities in the elderly hospitalised patients.



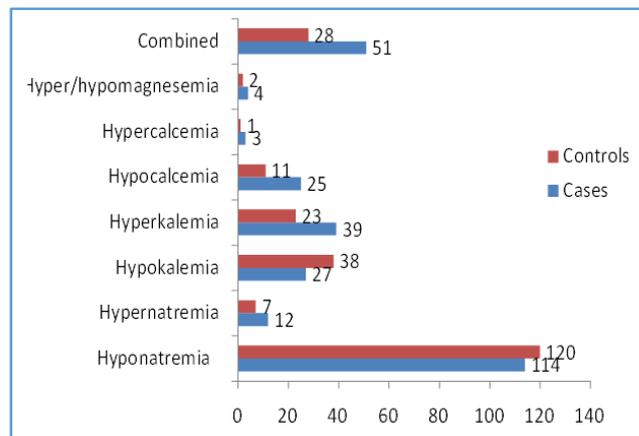
**Table 1: Age distribution of the patients (in years)**



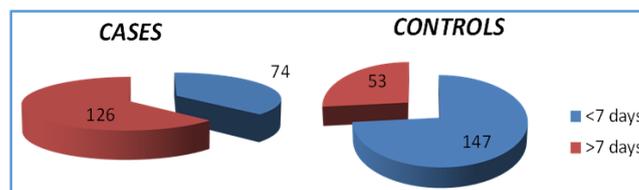
**Table 2: Sex distribution of patients**



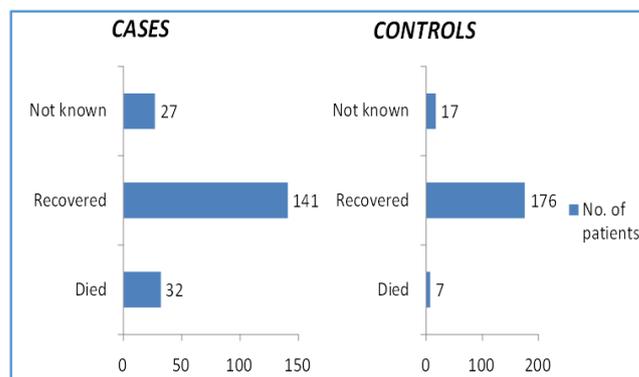
**Table 3: Associated comorbidities among cases and controls (Many patients had more than one comorbid condition)**



**Table 4: Pattern of dyselectrolytaemia**



**Table 5: Duration of hospital stay of patients**



**Table 6: Outcome after hospital stay**

**REFERENCES:**

1. Spencer G. US bureau of the census, Current population reports. Series P-25, No. 1018. Projections of the population of the United States by age, sex and race: 1988 to 2080. Washington D.C. Government Printing Office 1989;1-17.
2. Hawkins RC. Age and gender as risk factors for hyponatremia and hypernatremia. Clinica Chimica Acta 2003;337(1-2):169-172.
3. Fried LF, Palevsky PM. Hyponatremia and hypernatremia. Med Clin North Am 1997;81(3):585-606.
4. Snyder A, Fiegel DW, Arief A. Hypernatremia in elderly patients: a heterogeneous, morbid and iatrogenic entity. Ann Intern Med 1987;107(3):309-319.
5. Naureen Tareen, David martins, Glenn Nagami, et al. Sodium disorders in elderly. J Natl Med Assoc 2005;97(2):217-224.

6. Ayus JC, Arieff AI. Chronic hyponatremic encephalopathy in postmenopausal women: association of therapies with morbidity and mortality. *JAMA* 1999;281(24):2299-2304.
7. Clayton JA, Le Jeune IR, Hall IP. Severe hyponatremia in medical in-patients: aetiology, assessment and outcome. *QJ Med* 2006;99(8):505-511.
8. Hoyle GE, Chua MPW, Soiza RL. Prevalence of hyponatremia in elderly patients. *J Am Geriatr Soc* 2006;54:1473.
9. Mannesse CK, Vondeling AM, van Marum RJ, et al. Prevalence of hyponatremia on geriatric wards compared to other settings over four decades: a systematic review. *Ageing Res Rev* 2013;12(1):165-173.
10. Musso C, Liakopoulos V, De Miguel R, et al. Transtubular potassium concentration gradient: comparison between healthy old people and chronic renal failure patients. *Int Urol Nephrol* 2006;38(2):387-390.
11. Trenkwalder P, James GD, Laragh JH, et al. Plasma renin activity and plasma prorenin are not suppressed in hypertension screening to old age. *Am J Hypertens* 1996;9:621-627.
12. Passeri G, Pini G, Troiano L, et al. Low vitamin D status, high bone turnover and bone fractures in centenarians. *Journal of clinical endocrinology and metabolism* 2003;88(11):5109-5115.
13. Gloth FM III, Gundberg CM, Hollis BW, et al. Vitamin D deficiency in elderly homebound persons. *Journal of American Medical Association* 1995;274(21):1683-1686.
14. Sterns RH. Severe symptomatic hyponatremia: treatment and outcome. A study of 64 cases. *Ann Intern Med* 1987;107(4):656-664.