

# The Risk of Hyponatremia in The Elderly Compared with Younger in The Hospital Inpatient and Outpatient

**Parlindungan Siregar**

*Department of Internal Medicine, Faculty of Medicine, University of Indonesia - dr. Cipto Mangunkusumo Hospital.  
Jl. Diponegoro no. 71, Jakarta Pusat 10430, Indonesia.*

**Correspondence mail to:** [sparlindungan@yahoo.com](mailto:sparlindungan@yahoo.com)

## ABSTRACT

**Aim:** to compare the prevalences of hyponatremia between elderly and younger patients in hospital inpatients and outpatients setting.

**Methods:** this study was done using cross-sectional design. Medical records of all adult patients (age of more than 13 years) from March 2008 to March 2009 in Siloam Hospital Lippo-Village whose sodium plasma level data were recorded. The patients were divided into two main groups according to their age, that were elderly and younger. These two main groups were then divided into 4 sub-groups that were general inpatient, special inpatient, general outpatient, and emergency outpatient. The prevalence ratio of the proportion of hyponatremia between the elderly and the younger in the four sub-groups were then analyzed. Independency between the 4 sub-groups and frequency of hyponatremia in each of the two main group were tested by Chi-Square test, using SPSS statistics version 17.

**Results:** in the general inpatient, the prevalence of hyponatremia in the elderly group and the young group were 26.32% and 10.85% respectively, with the Prevalence Ratio of 2,43 (95% CI, 0,11-0,19). In the general outpatient, the prevalence of hyponatremia in the elderly group and the young group were 7.18% and 2.98% respectively, with the Prevalence Ratio of 2,40 (95% CI, 0,02-0,06). In the emergency outpatient, the prevalence of hyponatremia in the elderly group and the young group were 18.28% and 7.71% respectively, with the Prevalence Ratio of 2,37 (95% CI, 0,08-0,14). In the special inpatient, the prevalence of hyponatremia in the elderly group and the young group were 14.98% and 5.58% respectively, with the Prevalence Ratio of 2,69 (95% CI, 0,05-0,13). The risk to get hyponatremia during inpatient was significantly higher in the elderly with the Prevalence Ratio of 2.79 (95% CI, 0,03-0,07). Chi Square analysis which was done in both the elderly and the younger group revealed that the place of the services will influence the frequency of hyponatremia significantly ( $p = 0.000$ ).

**Conclusion:** compared with the younger group, the mean of the risk for the elderly group to get hyponatremia in the hospital inpatient and outpatient is 2.54 times higher.

**Key words:** hyponatremia, elderly, risk, inpatient, outpatient.

## INTRODUCTION

The incidence of hyponatremia in the elderly inpatient is quite high. Anpalahan reported that the frequency of hiponatremia in the elderly inpatient was equal to 25%.<sup>1</sup> The frequency of hyponatremia at institutional elderly homes is 18%, whereas in the elderly taken care at home is lower, namely 8%.<sup>2,3</sup> It seems that the frequency of hyponatremia in the elderly is influenced by those who took care of them. It is well known that there are eight physiologic changes that occurred in the elderly such as reduced total body water volume, reduced glomerular filtration rate, reduced urinary concentrating ability, increased ADH (anti diuretic hormone) concentration, increased ANP (atrial natriuretic peptide) concentration, declined aldosteron concentration, reduced sensitivity of the thirst central nervous system, and reduced free water clearance which make this group easy to be hyponatremic.<sup>4</sup>

Awareness about hyponatremia is important due to the complications such as weakness, and dizziness which could happen in patients with chronic hyponatremia. Decrease of consciousness as well as convulsion could also occur in acute hyponatremia with the worst complication of brain damage if the treatment is delayed.

Hyponatremia is the most common electrolyte disorder in hospitalized patients. The development of severe hyponatremia in hospitalized patients was associated with treatment-related factors.<sup>5</sup> Frenkel

WJ et al reported, based from their cohort study that there was an association between serum sodium levels at time of admission and mortality and morbidity in acutely admitted elderly patients. During three months after admission, the mortality was higher in the low-sodium group (107–130 mmol/L) than in the reference group (130–142 mmol/L), OR 1.5 (95% CI 1.0–2.2),  $P = 0.05$ .<sup>6</sup>

Prevention of these complications is essential, especially in hospitalized elderly patients, in order to decrease morbidity and mortality.

In accordance with these, in Siloam Hospitals Lippo-Karawaci from March 2008 to March 2009, all of the adult patients who had plasma sodium level data were investigated.

The aim of this study is to find out the risk for the elderly patients to get hyponatremia in the hospital compared with the younger patients.

## METHODS

This study was done using cross-sectional design.

All of the adult patients (age of more than 13 years old) who had plasma sodium data in the medical record of Siloam Hospitals Lippo-Village from March 2008 to March 2009 were recorded. The patients were divided into two groups, based on their age. Those who were less than 60 years old were included in the young group. Meanwhile, patients with age  $\geq 60$  years were included in the elderly group. These two main groups were then divided into four subgroups, based on their type of admission, general-inpatient, general-outpatient, special-inpatient (ICCU, ICU, and High-Care), and emergency-outpatient groups. The total numbers of the elderly or the younger patients and total numbers of the hyponatremic patients in the elderly or the younger in each subgroups were recorded.

Hyponatremia was defined as plasma sodium level of less than 136 meq/L.

To find the prevalence-ratio, the proportional data of the elderly and the young who had hyponatremia in each subgroups were analyzed.<sup>7</sup> Independency between the 4 sub-groups and frequency of hyponatremia in each of the two main groups were tested by Chi-Square test, using SPSS statistics version 17.

## RESULTS

From March 2008 to March 2009, the total numbers of elderly patients in the general-inpatient, general-outpatient, emergency-outpatient, and special-inpatient who had plasma sodium data were 718, 836, 968, and 327 patients respectively. The total numbers of the

younger patients in the general-inpatient, general-outpatient, emergency-outpatient, and special-inpatient who had plasma sodium data were 1567, 1575, 2646, and 968 patients respectively.

In the general-inpatient group, 189 out of 718 patients had hyponatremia and the prevalence of hyponatremia was 26.32% for the elderly group. Meanwhile, in the younger group there were 170 out of 1567 patients had hyponatremia and the prevalence was 10.85%. The Prevalence Ratio for the both groups was 2.43 (95% CI 0.11-0.19). (**Table 1**)

In the general-outpatient group, 60 out of 836 elderly patients had hyponatremia with prevalence of 7.18%. In the younger group, 47 out of 1575 patients had hyponatremia with prevalence of 2.98%. The Prevalence Ratio for the both groups was 2.40 (95% CI, 0,02-0,06). (**Table 1**)

In the emergency-outpatient group, 177 out of 968 elderly patients had hyponatremia and the prevalence of hyponatremia was 18.28%. In the younger group, 204 out of 2646 patients had hyponatremia and the prevalence was 7.71%. The Prevalence Ratio for the both groups was 2.37 (95% CI, 0,08-0,14). (**Table 1**)

In the special-inpatient group, 49 out of 327 elderly patients who had hyponatremia and the prevalence of hyponatremia was 14.98%. In the younger group, 54 out of 968 patients had hyponatremia and the prevalence was 5.58%. The Prevalence Ratio for the both groups was 2.69 (95% CI, 0,05-0,13). (**Table 1**)

In the elderly inpatient group (general-inpatient plus special-inpatient), 141 out of 939 patients had hyponatremia since the first day of hospitalization and the prevalence was 15,02%, while in the younger inpatient, 139 out of 2390 patients had hyponatremia since the first day of hospitalization and the prevalence was 5,82%. The Prevalence Ratio for the both groups was 2.58 (95% CI, 0,07-0,11).

In the elderly inpatient (general-inpatient plus special-inpatient), 69 out of 939 patients had hyponatremia during the day of hospitalization and the prevalence was 7,35%, while in the younger inpatient, 63 out of 2390 patients had hyponatremia during the day of hospitalization and the prevalence was 2,64%. The Prevalence Ratio for the both groups was 2.79 (95% CI, 0,03-0,07). (**Table 1**)

Thirty point six percent of all hyponatremic elderly patients were hospitalized via the emergency room and 25.79% patients were hospitalized via the outpatient department, while 26.47% of all the hyponatremic younger patients were hospitalized via the emergency room and 24.93% patients were hospitalized via the outpatient department.

**Tabel 1. Prevalence of hyponatremia in the elderly in comparison with the younger in the hospital setting**

	Elderly (%)	Younger (%)	Prevalence ratio
General inpatient	26.32	10.85	2.43 (95% CI 0.11-0.19)
Emergency outpatient	18.28	7.71	2.37 (95% CI 0.08-0.14)
Special inpatient	14.98	5.58	2.69 (95% CI 0.05-0.13)
General outpatient	7.18	2.98	2.40 (95% CI 0.02-0.06)
Getting Hyponatremia during the day of inpatient	7.35	2.64	2.79 (95% CI 0.03-0.07)

Twenty-nine point twenty five percent of all hyponatremic elderly patients only visited the emergency room and 14.63% only visited the outpatient department, while 37.40% of all the hyponatremic younger patients only visited the emergency room and 11.20% only visited the outpatient department.

Chi Square test which is done in both of the elderly and the younger group revealed that the place of the services will influence the frequency of hyponatremia significantly ( $p = 0.000$ ). The highest frequency is in the General Inpatient and followed by the Emergency Outpatient, Special Inpatient, and General Outpatient respectively.

## DISCUSSION

From the data collected, it is showed that the prevalence of hyponatremia in the elderly general-inpatients was 26.32%, as high as the prevalence of hyponatremia reported by Anpalahan, which is 25% or 43 out of 172.<sup>1</sup>

Compared with the younger group, the risk of the elderly in the general-inpatient for getting hyponatremia was significantly 2.43 times higher.

It means that the risk of the elderly in the general-inpatient for getting hyponatremia is higher. It is also showed that the risk of getting hyponatremia in the elderly were higher than in the younger in other services of the hospital such as in outpatient department, emergency department, and special-inpatient, with the significant prevalence-ratio of 2.4, 2.37, and 2.69 respectively. It is interesting that the risk for getting hyponatremia during hospitalization was also higher in the elderly patients, the significant prevalence-ratio was 2.79 (95% CI, 0.03-0.07).

Looking at the etiology of hyponatremia, not all diseases could cause hyponatremia. Some of the diseases that could cause this condition are heart failure, cirrhosis, SIADH (syndrome of inappropriate ADH secretion), adrenal insufficiency, hypothyroidism, advanced renal failure, hyperglycemia, hyperlipidemia, and hyperproteinemia.

Many studies had shown that high water intake was the risk factor for getting hyponatremia in the healthy elderly people.<sup>1,3,4,8-11</sup> Due to the eight physiologic changes in the elderly, this group is more sensitive than the younger group for getting diluted hyponatremia. Recent clinical study done by the author revealed that in the healthy elderly, daily water intake of 1500 mL could potentially induce hyponatremia.<sup>9</sup> This condition was likely to occur in younger patients as well, but with much higher water intake than the healthy elderly, such as in the primary polydipsia. Looking at the previous studies,<sup>1,3,4,8-11</sup> high water or fluid intake is one of the factors that cause the elderly group in this study having higher risk for getting hyponatremia. Due to insufficient data, not all the causes of hyponatremia in the patients of this study were investigated. However, this study showed that in hospitalized patients, the risk for getting hyponatremia was significantly higher in the elderly, in comparison with in the younger. It means that high awareness is needed to anticipate the high possibility of hyponatremia in the hospitalized elderly patients.

The places of the medical services also have a role in influencing the frequency of hyponatremia as was found significantly in this investigation. The highest frequency is in the general Inpatient and followed by the emergency outpatient, special Inpatient, and general outpatient respectively in both of the elderly and the younger group. It was relevant to the report of Hoorn EJ et al<sup>5</sup> that the development of hyponatremia in hospitalized patients was associated with treatment-related factors.

## CONCLUSION

As the conclusion of this study, in comparison with younger patients, the mean risk of the elderly group to get hyponatremia in the hospital inpatient and outpatient is 2.54 times higher.

A prospective cohort study should be done in order to find the cause of hyponatremia in both elderly and younger patients in hospital inpatient/outpatient setting, as well as to find the answer to what causes the elderly people to have a higher risk of getting hyponatremia.

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