



# An Exploratory Study Examining the Adequacy of Water Intake among the Elderly Inpatients

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## Abstract

The seniors occupy a significant proportion of the acute hospital beds and this number will likely increase in the future. Ensuring adequate water consumption among the seniors to avoid dehydration is often not registered as a priority in the hospital or nursing home setting, especially among the seniors with cognitive issues. The seniors with cognitive issues frequently need assistance with drinking due to concomitant dysphagia. The study showed a staggering 90% of the elderly inpatients could not meet their recommended daily water requirement during their stay in an acute geriatric ward, even among the independent elderly. The factors which contributed to poor water intake included cognitive issues, functional dependency and dysphagia.

**Keywords:** Water intake; Dysphagia; Elderly; Dementia; Delirium

## Introduction

As the world ages, the proportion of elderly >65 years old occupying the hospital beds will rise. Currently in Singapore, it is estimated that about 60% of the hospital beds are occupied by the older persons above the age of 65 [1]. This figure will likely rise in the years to come, since the elderly have multiple complex comorbidities and once, they are admitted, they will likely stay longer than the younger patients due to hospital associated complications like dehydration, malnutrition, falls, delirium, and nosocomial infections [2].

The elderly is at higher risk of developing dehydration during their hospital stay, especially in the hot and humid weather like Singapore. Ensuring adequate water intake during the hospital stay is a challenging task for the health care staff for various reasons. Factors which are known to increase risk of dehydration include frailty, cognitive deficit, altered mental status, reluctance to drink due to risk of urinary incontinence, inaccessibility to water and the risk of aspiration due to underlying dysphagia requires assistance during drinking [3].

Data from Nursing Home residents showed that dehydration occurred in 31% of residents over 6 months and the greatest risk factor is an overall poor oral intake. Another study showed that 98% of nursing home residents consumed less than 1500 ml/day which is below the daily recommended fluid intake [4].

There are factors related to poor fluid intake in institution settings, such as clinical, social and environmental factors. The elderly residents often have cognitive impairment and hypodipsia which contribute to lack of awareness of thirst. Dysphagia among the frail elderly increases aspiration risk which necessitates trained staff to assist for drinking and during meal times. Nursing homes frequently face problems with high attrition rate and there may not be adequate trained staff to assist with thickening fluids and assisting the residents to maintain adequate hydration. Physical inaccessibility of fluid is a common factor in institutions where the water jugs or cups are often placed a distance away from the residents [5,6].

## Method

This is a descriptive, retrospective study conducted using a convenience sampling method. It was approved by the Institutional Review Board. The aim of study was to determine whether the elderly patients admitted to the acute geriatric wards consumed adequate fluid during hospitalization based on the recommended amount of daily fluid of (30 ml/kg/day)\* [7,8] and to identify the intrinsic and extrinsic factors for fluid intake among the elderly.

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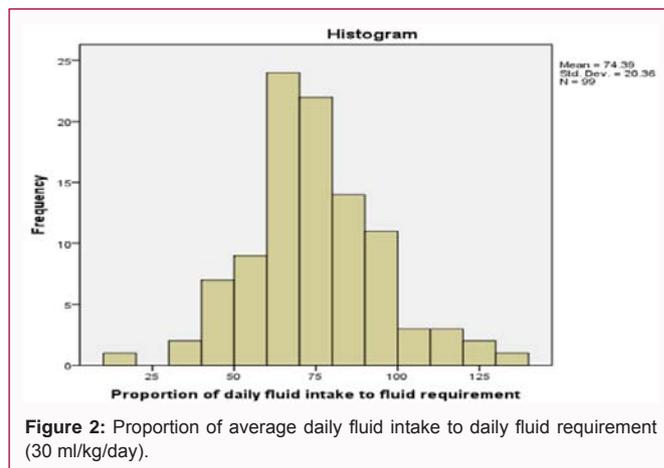
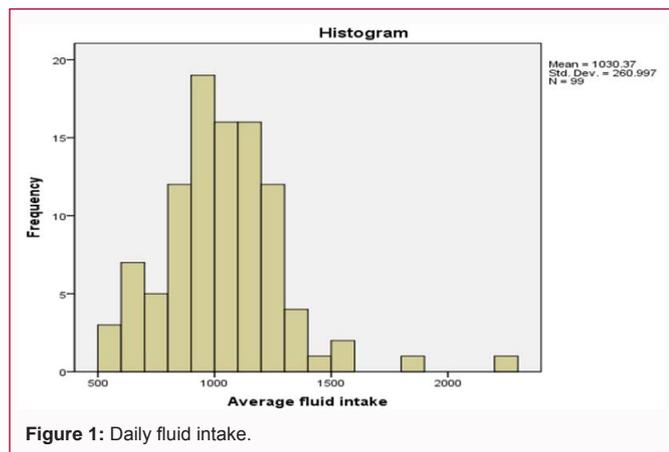
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**Table 1: Demographics.**

Characteristics	(N=99)
<b>Age</b>	
Range	70-102 years old
Mean	85.7 years old
<b>Gender:</b>	
Female	(N=64) - 65%
Male	(N=35) - 35%
<b>Race:</b>	
Chinese	(N=77) - 78%
Malay	(N=17) - 17%
Others	(N=5) - 5%

The study was conducted at three acute geriatric wards in a large teaching hospital. Data were gathered from nursing records during the hospital admission. A total of 99 participants were included in the one-month study period. The patients on tube feeding were excluded from the study.

Data collected included patients' demographics, mean amount of water consumed daily, factors which may have influenced oral intake such as functional status, requirement for assistance during mobility and feeding, presence of dysphagia, dementia or delirium. The authors examined the length of stay, constipation and hospital acquired infections as outcomes related to inadequate hydration. The data collected was analyzed using SPSS version 21.

\*Definition of adequate daily fluid intake in elderly is based on any one of the following standards: [9,10]

- (1) 30 ml/kg/day [7,11]
- (2) 30 ml/kg/day, with a minimum of 1,500 ml [11,12]
- (3) 1 ml fluid per kilocalorie energy consumed [13]

**Results**

The demographic characteristics of the participants are shown in (Table 1).

The mean age of the patients was 85.7 years (range 70 to 102). Female comprised 65% of the participants and majority were Chinese at 78% followed by Malay 17%.

Almost half of the participants (46.4%) were fairly independent,

**Table 2: Factors influencing oral intake.**

Characteristics	(N=99)
<b>Mobility status:</b>	
Independent to Supervised	(N=46) - 46.4%
Assisted	(N=36) - 36.3%
Dependent	(N=17) - 17.1%
<b>Self-feeding status:</b>	
Yes	(N=65) - 66%
No	(N=34) - 34%
<b>Presence of dysphagia:</b>	
Yes	(N=38) - 38.3%
No	(N=61) - 61.6%
<b>Use of thickener:</b>	
Yes	(N=33) - 33.3%
No	(N=66) - 66.6%
<b>Presence of Dementia</b>	
Yes	(N=50) - 50.5%
No	(N=49) - 49.4%
<b>Presence of Delirium</b>	
Yes	(N=44) - 44.4%
No	(N=55) - 55.5%

36.3% needed assistance and 17.1% were totally dependent (Table 2). Majority of the patients were independent for feeding (66%) but 34% needed assistance. Among the patients in the study, 61.6% had dysphagia although almost two thirds of them were able to consume thin fluids. Half the study patients had dementia (50.5%) and delirium was reported among 44.4% of the patients. The mean amount of daily water consumption was 1030mls (range 500 ml to 2200 ml) (Figure 1). Only 10% of the patients studied were able to meet the lower limit of their daily recommended water consumption, and even then, they only met 74% of their recommended daily water intake (Figure 2).

Using a multi-variant test to examine the factors predicting oral fluid intake, older age, dysphagia and dementia were the main predictors for the inability to meet the daily recommended water intake (Table 3 and 4).

Inadequate oral fluid intake however, had no statistical significant association to constipation, hospital acquired infection and length of

**Table 3:** Factors significantly associated with the oral fluid intake by univariate test.

Factors	Frequency	%	Proportion of fluid intake to fluid requirement mean ± SD	P value
<b>Age +</b>				
<= 84 years	43	43.4	68.51 + 17.51	0.01
>= 85 years	56	56.6	78.90 + 21.37	
<b>Weight*</b>			47.92 + 11.563	<0.001
<b>Presence of delirium +</b>				
No	55	55.6	80.04 + 21.570	0.013
Yes	44	44.4	69.87 + 17.366	

\*Pearson correlation

+Independent T test

**Table 4:** Factors predicting the oral fluid intake by multi-variant test (linear regression).

Factor	B	Standard Error	P value
Age	-1.045	0.175	<0.001
Presence of dysphagia	-19.964	8.395	0.02
Presence of dementia	-8.783	4.247	0.042

hospital stay. Although, patients without constipation were able to meet higher proportion of daily fluid requirement (76%) than those patients with constipation (70%).

## Discussion

The normal physiological response to dehydration includes a sense of thirst to initiate water intake and release of Antidiuretic Hormones (ADH) to reduce water excretion. Unfortunately, both of these compensatory mechanisms are defective among the elderly [14,15].

In the acute hospital, excessive fluid loss among patients may occur through vomiting, diarrhea, ileus, high output intestinal fistula, fever (through sweat and increased insensible fluid loss by hyperventilation), polyuria (post-obstructive diuresis, diabetes insipidus, salt losing nephropathy, or medication side effect) [3]. Dehydration and its consequences increase the morbidity and mortality risk by seven folds in elderly [16]. These undesirable outcomes to a seemingly avoidable problem cause physical distress to patients and have significant impact on healthcare cost [17].

Findings in this study showed that a staggering 90% of the elderly inpatients in the acute geriatric wards failed to meet the recommended daily fluid requirement. Of note was that 46.4% of the patients were independent in their mobility and two thirds were able to feed themselves. Therefore, functional independence may not be the major determinant for adequacy of water consumption in a hospital setting. For this group of elderly, perhaps the care staff needs to put in time and effort to educate patients on the importance of meeting the daily recommended water intake in order to avoid dehydration during hospitalization.

These findings were consistent with a study conducted by Gaspar in 1999, which showed that patients with higher functional dependency on staff had higher fluid intake than those with better function. The explanation for this interesting finding is likely because the staff gave more assistance and frequent attention to the more dependent patients, while assuming the independent seniors could help themselves [18]. The more independent elderly may be perceived as being able to maintain their own oral intake, while they were actually not able to so satisfactorily thus may be at higher risk

of dehydration.

Half of our study subjects had underlying dementia and 44% had delirium while in the ward, which could have contributed to the poor oral intake during their hospital stay. Studies have shown that patients with cognitive impairment were unable to meet their own needs independently, such as maintaining adequate caloric intake and fluid consumption [6]. Language barrier may have contributed to the inability to communicate thirst to the nursing staff among the elderly patients, particularly the elderly with cognitive issues [19]. The elderly with cognitive issues were likely to need assistance with their basic activities of daily living, including eating and drinking. In the hospital setting, fluids may be inaccessible and the staff may not be readily available to serve water in between meals or to assist with thickening the fluid prior to consumption.

Dysphagia was an important factor which predicted a reduction of fluid intake by 19% in a study conducted by McGrail [5]. The study showed that patients taking thin fluids were able to consume more fluid than patients requiring thickener [20]. The use of thickener for fluids requires an assistant to ensure the correct consistency is achieved. In addition, the elderly who required thickened fluids would likely need assistance for drinking. In institutional setting like nursing homes and hospitals, trained staff may not be readily available.

Inadequate fluid intake is one of the most common causes of constipation, especially among the elderly. Increasing daily fluid intake may increase stool frequency and enhance the beneficial effects of dietary fiber [21]. In the local setting, most of our elderly are reluctant to drink water, despite the warm and humid tropical weather. The frequently quoted reasons include increased trips to the toilet, reluctance to trouble their caregivers for toilet trips, risk of incontinence and nocturia which disrupts their sleep. However, restricting overall fluid consumption has not been shown to reduce urinary frequency or incontinence severity [22].

The data collected showed no statistically significant association between fluid intake and constipation, hospital acquired infection or longer length of hospital stay. This may be due to small sample size. Hospital acquired infection and length of stay often have multiple contributing factors.

Kayser-Jones showed that among the elderly residents in nursing homes, multiple factors need to be addressed in order to improve nutrition and reduce dehydration. Some of the identified factors which had negative impact on the residents' nutritional intake included lack of staff education, inadequate staffing, and lack of supervision during meal times, staff's disregard for residents' cultural and personal preference, lack of assessment for cognitive problems,

dysphagia, poor oral health and hygiene [19].

Assisting the elderly with feeding is a time-consuming task and requires patience as well as knowledge of physiological changes in elderly, especially caring for the cognitively impaired elderly with dysphagia [23]. In a busy acute hospital setting, the staff are frequently shorthanded and the working condition is task oriented with a tight schedule to keep. Meal times in a hospital are also time scheduled. Therefore, for the elderly patients who require assistance for feeding, the staff may not be trained or be readily available to assist.

### Limitation of the Study

The sample size was small, and it was a retrospective nursing case notes review. There were no blood investigations to examine consequences of inadequate water consumption like kidney injury or incident delirium due to dehydration. This study did not consider the other sources of fluid which the participants had taken which are not documented under fluid intake e.g. fruits, porridge, soup. Future research should focus on examining nurses' knowledge towards patients' fluid intake, exploring ways to facilitate and improve patients' fluid intake in order to reduce complications arising.

### Conclusion

Ensuring adequate water consumption is often not included in the routine care plans for the elderly patients in an acute hospital. This study illustrated that an overwhelming 90% of the hospital inpatients failed to meet their daily recommended water intake. Since the elderly patients are known to stay longer in the hospitals compared to the younger patients, the risk of dehydration is therefore, high. Dehydration may lead to other associated complications like infections, venothrombotic complications, kidney injuries etc. which may lengthen length of hospital stay with negative consequences among the elderly. Medical and nursing staff should pay more attention to ensure adequate daily fluid consumption especially among the frail vulnerable elderly under their care.

### Recommendation for Future Studies

Having this preliminary data, investing time and effort to evaluate the effectiveness of an individualized feeding regime based on patients' body weight, their daily caloric and fluid requirements and clinical outcomes. It may be interesting to explore the effectiveness of different measures to encourage oral fluid intake, such as group dining and scheduled fluid feeding.

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