Insight 27
September 2002

More Than One in Three Older Americans May Not Drink Enough Water

WenYen Juan, PhD
P. Peter Basiotis, PhD

With contributions from the USDA Center for Nutrition Policy and Promotion Aging Interest Group

Introduction

Whether drunk from the tap or a bottle or eaten in foods, water has important health benefits. Insufficient consumption can lead to muscle spasm, renal dysfunction, increased risk of bladder cancer, and even death. Because adequate water consumption is important, the Institute of Medicine (a member of the National Academies), through its Food and Nutrition Board, is developing Dietary Reference Intakes (DRI) for water and electrolytes. (The new DRIs are superceding the old Recommended Dietary Allowances, or RDAs.)

The traditional recommendation for adequate water consumption for adults is "at least 8 glasses of water a day." However, no scientific research has examined the relationship between health risk and this traditional recommendation. Also, little scientific study has been published that compared traditional and other current recommendations of water consumption among healthy, free-living older adults.

Because the elderly are especially at risk of dehydration, we examined total water consumption from the moisture contained in foods and beverages as well as from plain water. We used data from three national surveys: (1) the Third National Health and Nutrition Examination Survey, 1988-1994 (NHANES III); (2) the 1994-96 Continuing Survey of Food Intakes by Individuals (CSFII 94-96); and (3) the National Health and Nutrition Examination Survey, 1999-2000 (NHANES 99-2000). Our sample consisted of 4,818 adults ages 60 or older from NHANES III, 3,092 from CSFII, and 1,391 from NHANES 99-2000. Body weight was self-reported in the CSFII but was measured by a trained examiner in both NHANES surveys. Self-reported intake data were based on 1-day dietary recall in all three surveys. The results reported in this study are weighted to reflect the U.S. elderly population.

Importance of Water Consumption

Water is the most abundant and essential component or macronutrient in the human body. It comprises, on average, about 60 percent of total body weight for young adults and about 50 percent for the elderly. Various body components account for different percentages of the body's water content; generally, water constitutes 65 to 75 percent of muscle weight and 50 percent of body fat weight. The proportion of body water is generally smaller in females, the elderly, and the obese because of the smaller portion of muscle mass in these populations.

The human body cannot store water; therefore, fluid must be replaced and

kept in balance daily. Body water turnover rate is estimated to be 4 percent of total body weight to maintain normal body functions, which include excretion of body waste and evaporation from the lungs and skin. Recommendations for adequate water intake by adults are generally based upon several factors: humidity, temperature, altitude, exercise status, and use of diuretic medications.

Dehydration in the Elderly

Dehydration occurs when water balance is negative; that is, intake of water is less than its loss (McArdle, Katch, & Katch, 1996). This issue is especially pertinent to older adults when total available body water has decreased because of losses in muscle mass, changes in the cells as people age, less efficient kidney function, and reduced thirst sensation. Thirst is usually the most important mechanism used to increase water consumption. When the volume of body water decreases, thirst signals the brain and triggers the person to consume fluids. Older adults, compared with other segments of the population, have impaired responses to reduced body water; thus, they are most vulnerable to dehydration.

Recommendations for Water Intake

For adults whose energy expenditure and environmental exposure are average, the Food and Nutrition Board recommends 1 ml of water per kilocalorie expenditure (or, at 237 ml per 8 fluid ounces, 4.2 glasses per 2,000 kilocalories) as a general guideline for total water consumption (National Research Council, 1989). Chernoff (1999) recommends a total fluid intake of 30 ml/kg body weight (or 0.06 glasses per pound of body weight) and with a minimum of 1,500 ml (6.3 glasses) per day. We use this criterion to assess the adequacy of water intake by the elderly U.S. population.

Table 1. Median daily total water consumption by adults ages 60 years or older

	Plain water (8 fl. oz. glasses)[1]	Moisture (8 fl. oz. glasses)[2]	Total water (8 fl. oz. glasses)	Total water (8 fl. oz. glasses)/pound body weight
Did not meet the recommendation[3]				
NHANES III N=1,444 (30%)	2.0	5.3	7.7	0.05
CSFII 1994-96 N=1,351 (44%)	2.0	5.1	7.2	0.04
NHANES 1999-2000 N=1,520 (37%)	2.7	5.1	8.1	0.05
Met the recommendation[3]				
NHANES III N=3,374 (70%)	5.5	7.6	13.2	0.08
CSFII 1994-96 N=1,741 (56%)	4.0	7.5	11.9	0.08
NHANES 1999-2000 N=871 (63%)	5.6	7.6	13.5	0.08

[1]Plain water includes bottled, spring, or tap water.
[2]Moisture is the water from all foods and beverages, except from plain water.
[3]The recommendation is 0.06 glasses per pound of body weight.

More Than One-Third of Older Adults Have Inadequate Water Consumption

About 30 percent of subjects from NHANES III and 37 percent from NHANES 99-2000 did not meet the recommendation of 30 ml/kg body weight (0.06 glasses per pound of body weight) for total water consumption (table 1). Forty-four percent of the subjects from the CSFII 94-96 did not meet this recommendation. Among older adults who did not meet the recommendation, the median total water consumption was about 0.05 glasses per pound of body weight in all three national surveys, compared with 0.08 glasses per pound of body weight among their counterparts who met the recommendation. Additionally, those not meeting the recommendation drank about two to three times less plain water and consumed about 1.5 times less moisture from foods and beverages than did those meeting the recommendation. However, based on this study, over half of older adults ages 60 years or older who met the recommendation of 0.06 glasses per pound of body weight consumed from 12 to 13.5 glasses of total water daily, including about 4 to 5.6 glasses from plain water.

Conclusion

Based on the analysis data and the particular criterion used, more than one in three Americans over the age of 60 may not be consuming enough total water from all sources.

In addition to drinking plenty of plain water every day, eating foods with a high moisture content—such as fruits and vegetables—could be a good way to increase total water consumption. Water constitutes 90 percent of most fruits and vegetables and about 50 percent of meats and cheese.

Valtin (2002) suggests that caffeinated drinks (e.g., coffee and soft drinks) and alcoholic beverages may also count towards daily consumption of fluid. However, because of the diuretic effects of these types of beverages, additional plain water should be consumed to replace the water that is lost.

Further investigation of the recommendation for optimal water consumption by older adults should focus on different physiological needs. For example: Living arrangements, physical activity, and medications can affect water consumption and physiological needs. In addition, intakes of electrolytes can also affect the hydration status of a person.

References

Chernoff, R. (1999). Nutritional support in the elderly. *Geriatric Nutrition: The Health Professional's Handbook* (2nd ed.). Gaithersburg, MD: Aspen Publishers.

McArdle, W.D., Katch, F.I., & Katch, V.L. (1996). *Exercise Physiology: Energy, Nutrition and Human Performance* (4th ed.). Baltimore, MD: Williams and Wilkins.

National Research Council. (1989). Food and Nutrition Board. Washington, DC: National Academy of Sciences, National Academy Press.

Valtin, H. (2002, August 8). "Drink at least eight glasses of water a day"—Really? Is there scientific evidence for '8x8'?" *American Journal of Physiology: Regulatory, Integrative and Comparative Physiology 10*, 1152.