

ASSESSMENT OF TOTAL WATER AND BEVERAGE INTAKE BY THE ELDERLY LIVING IN WARSAW REGION

Barbara Pietruszka, Magdalena Krajewska

Faculty of Human Nutrition and Consumer Sciences, Warsaw Agricultural University, Warsaw

Key words: total water intake, beverages, fluid intake, elderly

Total water and beverage intake was assessed among 206 elderly living in urban, suburban and rural areas of Warsaw region. All sources of water were taken into consideration (food, beverages, water added during meal preparation). Beverages were considered fluids consumed in a glass or a cup. The total water intake was compared with the standard. The results indicated that the total daily water intake was low and did not meet recommendations. This inadequate water intake was wide-spread among the respondents, especially among women, persons living in suburbs and rural areas, people with no education and elementary educational level, and with low income. On the average, men consumed 70% of recommended total daily water intake, while women – only 64%. Respondents consumed only about 800 g of beverages, which is less than 4 glasses per day (8 glasses are recommended by the Russel guide pyramid). The conclusion is that the total water and fluid intake should be a part of the diet record to identify individuals and population groups at risk of dehydration. It is also necessary to educate elderly as well as the members of their families and their caregivers about importance of the adequate daily fluid intake.

INTRODUCTION

Water is one of the most important components of human body. Proper hydration is the main factor for maintaining good health status. Due to everyday losses of water associated with urination, sweating, evaporation and breathing, it is necessary to consume water in amounts exceeding 1.5 L [Rikkert *et al.*, 1998].

The risk of dehydration increases with age and is connected to the total body water reduction, impairment of water renal conservation, and reduction of the thirst perception by the elderly [Rikkert *et al.*, 1998; Wilson, 1998]. Additionally, a lot of elderly suffer from depression and diseases. The risk is often connected with disabilities in performing everyday chores, poor mental state which may increase their vulnerability to dehydration by reducing food and fluid intake. Several medicines used by elderly (*e.g.* laxatives, diuretics) can also cause dehydration [Brzozowska, 2000; Steen, 1997].

Dehydration may cause such symptoms as dry mouth feeling, constipation, dizziness and unconsciousness, renal impairment in elderly. Other signs are chronic fatigue or tiredness [Wilson, 1998; Kleiner, 1999].

Many authors noticed that dehydration is a common disorder among older hospital patients and homecare residents [Chidester & Spangler, 1997; Kayser-Jones *et al.*, 1999]. Only few papers present results of surveys conducted among non-institutionalized elderly. Because the adequate daily total water intake could help keep persons more healthy it is important to identify groups of risk to prevent

dehydration. This is especially important for free-living elderly, because the symptoms of dehydration by elderly are very often absent or non-specific [Wilson, 1998].

The aim of the study was to assess the average daily total water and beverage intake of the non-institutionalized elderly from the Warsaw region.

MATERIALS AND METHODS

The study was conducted in April–May 1999 among randomly selected 206 elderly aged 75–80 years living in urban (42 respondents from Warsaw), suburban (72 persons from Marki, small town near Warsaw), and rural areas (92 persons from three villages near Warsaw). General information about respondents (socio-demographic, economic and health data) was collected during personal interviews using a structured questionnaire. Characteristics of the respondents are presented in Table 1.

Nutritional data were collected by dietary diary method during three consecutive days, always including one week-end day. Weighing, household measures or a catalogue of pictures of individual food portions were used to assess the portion size [Szponar *et al.*, 2000]. The data were corrected by the interviewers.

Water intake by respondents was assessed on the basis of the Polish nutrient data base [Kunachowicz *et al.*, 1998] and expressed as the average daily consumption over a period of three days. All sources of water were taken into consideration: beverages, soups, food products and water added during meal preparation. To assess if the water intake was

TABLE 1. Characteristics of the population under study.

	Respondents	
	n	%
Gender		
female	108	52.4
male	98	47.6
The place of living		
city	42	20.4
town	72	35.0
village	92	44.6
Educational level		
no education, elementary	133	64.8
secondary	50	24.3
higher	22	10.7
Marital status		
single	7	3.4
married	107	51.9
divorced/widow(er)	92	44.7
Economic status (self-reported)		
good	28	13.6
moderate	114	55.4
poor	64	31.0
Health status (self-reported)		
good	49	23.8
moderate	101	49.0
poor	56	27.2
Physical activity level		
high	57	28.0
average	86	42.0
low	63	30.0

sufficient, the following standard was used [Albala *et al.*, 1997]: 100 g of water \times 10 kg (for the first 10 kg of body mass), plus 50 g of water \times 10 kg (for next ten kg of body mass), plus 15 g of water \times each kg above 20 kg of body mass. The standard was estimated for each respondent individually.

Beverages were defined as all fluids consumed in a glass or a cup (tea, coffee, juices, tap water, mineral water, bottled water, soft drinks, milk and milk beverages, such as yogurt and kefir).

Statistical analysis was carried out with the Statistica version 5.5 PL software. The significance of differences in the mean values between subgroups was evaluated using the variance analysis or the Kruskal-Wallis test, and for non-parametric variables the Chi²-test was used with the p value set at 0.05.

RESULTS AND DISCUSSION

The total water consumption was too small to meet the standard of water intake (Table 2). Men, on the average, consumed 70% of the recommended total water intake, while women – only 64%. The minimum and maximum values of water intake were lower among women than men therefore women are at higher risk of body dehydration than men.

People who had daily water intake from all sources under 1 000 g (6% of respondent, 13 persons among them

TABLE 2. Average total water intake by respondents.

Water intake [g]	Total n=206	Men n=98	Women n=108
g			
Recommended total water intake*	2271 \pm 187	2340 \pm 175***	2211 \pm 390***
Mean \pm SD**	1504 \pm 390	1616 \pm 441***	1401 \pm 363***
Minimum	690	976	691
First quartile (Q ₁)	1190	1257	1157
Third quartile (Q ₃)	1775	1970	1585
Maximum	3266	3267	2655
% of recommended water intake			
Mean \pm SD*	67.1 \pm 19.0	70.0 \pm 20.0***	64.5 \pm 18.0***
Minimum	27.9	37.9	27.9
First quartile (Q ₁)	52.6	53.3	52.5
Third quartile (Q ₃)	78.4	83.8	73.9
Maximum	139.3	139.3	123.2

* estimated according to formula given in Material and Methods [Albala *et al.*, 1997]; ** SD – standard deviation; *** p<0.01.

11 women) were at the highest risk of dehydration. Only 14 individuals satisfied the water consumption standard of 100% and above, among them 7 men and 7 women.

The results obtained by other authors indicated also that the daily total water intake by elderly in Poland is not sufficient. The study conducted in Warsaw in 2001 among elderly attending senior clubs showed that the daily water intake was approximately 1 570 g, which is only 61% of the recommended intake [Gulińska & Roszkowski, 2001]. Authors considered the formula: 100 g of water \times 10 kg (for the first 10 kg of body mass) + 50 g of water \times 10 kg (for next ten kg of body mass) + 20 g of water \times each kg above 20 kg of body mass as recommended intake [Brown, 1996].

Data from the SENECA study, conducted in 1993 in Poland, showed that the elderly consumed less total water than respondents from other European countries. Authors accepted 1 700 g of water as a cut-off value. More than 60% of female and 40% of male in Poland had the water intake below this value [Haveman-Nies *et al.*, 1997]. Our study indicated that about 75% of the respondents had the water intake below 1 700 g (the third quartile, Table 2).

Not only had the elderly such low total water consumption. A study conducted in 1994–95 among adults in three regions in Poland indicated that also in this population group average total water intake was about 1 600 g [Pietruszka & Zielińska, 2000].

The results of statistical analysis of influence of some demographic data on the total water intake are presented in Table 3.

Among all analyzed demographic factors the place of living and educational level had the biggest influence on the amount of daily water consumption. Warsaw citizens consumed significantly more water (about 1 787 g/day) than people living in suburban and rural areas (1 419 and 1 463 g/day, respectively). People with higher educational level consumed more water (1 868 g/day) than individuals who finished secondary school (1 731 g/day), persons with no education or with elementary educational level (1 436 and 1 410 g/day, respectively). Therefore the persons who are at a risk of dehydration are those living in suburban and rural areas, with no education or elementary educational level.

Among health factors the occurrence of hypertension influenced the level of water intake. People who declared in our study that they suffer from hypertension consumed about 190 g of water less than people with proper blood tension (Table 3).

TABLE 3. Average amounts of water intake among elderly as a function of demographic data.

	n	Water intake in g (mean ± SD)	% of standard (mean ± SD)	ANOVA** (p)
Place of living				
city	42	1787±469	78.4±19.7**	0.00003
town	72	1419±398	62.4±16.6 ^b	
village	92	1463±389	65.4±18.4 ^b	
Educational level				
no education, elementary	133	1411±386	62.7±16.4**	0.00000
secondary	50	1731±504	79.0±23.1 ^b	
higher	22	1868±410	81.2±16.5 ^b	
Marital status				
single	7	1364±476	64.1±20.9	NS
married	107	1566±394	68.1±17.2	
divorced/widow(er)	92	1464±463	66.1±20.7	
Material status				
good	28	1728±479	74.8±19.9	NS
moderate	114	1486±388	65.7±17.4	
poor	64	1469±461	66.0±20.6	
Health status				
good	49	1596±438	71.2±19.2	NS
moderate	101	1485±379	66.0±17.6	
poor	56	1456±450	65.4±20.8	
Chronic diseases				
yes	171	1490±330	67.5±19.8	NS
no	35	1519±450	65.0±14.2	
Hypertension				
yes	50	1385±360	61.6±16.6	0.03309
no	156	1574±470	69.8±20.5	

* Differences between numbers marked with different letters are statistically significant. ** As the recommended amount of water differ among people in subgroups, statistical analysis was conducted only for % of standard water intake. Standard of water intake was estimated individually for each respondent according to formula taken in Material and Methods [Albala *et al.*, 1997]. NS = Statistically insignificant.

The most important source of water for the people are beverages. The analysis of the average daily beverage intake showed that the respondents consumed only about 800 g, *i.e.* less than 4 glasses of fluids (Table 4). Beverages were consumed most often during meals. Between meals the respondents consumed only about 17% of the daily fluids intake. We found a statistically significant difference between the beverage consumption by men and women. The total beverage consumption and beverages intake during meals were higher among men than women (the difference was 62 g and 80 g, respectively – Table 4). We did not observe any difference in the amounts consumed between meals.

The American pyramid guide for elderly aged above 70 years recommends about 8 glasses of fluids every day [Russel *et al.*, 1999]. There is a question however if such high fluid intake is safe for all elderly. Additionally high fluid intake increases volume of urine what can be inconvenient for elderly and can result in awakening at night [Lindeman *et al.*, 2000].

TABLE 4. Average amounts of daily beverages intake as a function of gender.

Intake	Average intake ± SD [g]			t-Student test (p)
	Respondents			
	Total n = 206	Men n = 98	Women n = 108	
Total	801±257	848±378	786±257	0.04672
With meals	671±217	713±252	633±173	0.0079
Between meals	138±240	140±282	137±197	NS

The Polish elderly consumed only half of fluids recommended in this pyramid. Such a low daily intake may cause mild chronic dehydration and, as a consequence, health problems. It seems important to encourage elderly to higher beverages consumption, especially between meals. Verbal prompting, making drinks more available, or serving beverages preferred by elderly could improve the fluid intake. A survey among residents of nursing homes indicated that such intervention is effective [Simmons *et al.*, 2001].

CONCLUSIONS

1. The low daily beverage and total water intake is wide-spread among independently living elderly, especially among women, people living in suburbs and rural areas, and people with no education and elementary educational level.

2. The total fluid and water intake should be a part of the diet record to identify individuals and population groups at a risk of dehydration.

3. Because low fluid and total daily water intake may cause health problems it is necessary to educate elderly as well as the members of their families and their caregivers about the importance of the adequate daily fluid intake.

ACKNOWLEDGEMENTS

This work was carried out with the financial support for the Faculty of Human Nutrition and Consumer Sciences of the Warsaw Agricultural University from a grant from the Polish State Committee for Scientific Research.

REFERENCES

- Albala C., Salazar G., Yanez M., Bounout D., Aicardi V., Aguirre Chem E., Vio F., Validation of an anthropometric model for total body water determination in the elderly. *Nutr. Res.*, 1997, 17, 1–7.
- Brown R.G., Zaburzenia równowagi wodnej i sodowej. *Medycyna po dyplomie*, 1996, 5/4, 135–143 (in Polish).
- Brzozowska A., Składniki mineralne. Woda. *In: Żywność Człowieka. Podstawy nauki o żywieniu.* (ed. Gawęcki J., Hryniewiecki L.), Wydawnictwo Naukowe PWN 2000, pp. 231–237 (in Polish).
- Chidester J.C., Spangler A.A., Fluid intake in the institutionalized elderly. *J. Am. Diet. Assoc.*, 1997, 97, 23–28.
- Gulińska E., Roszkowski W., Spożycie wody przez wybraną grupę osób starszych. *Żyw. Człow. Metab.*, 2001, XXVIII Suppl., 491–495 (in Polish).
- Haveman-Nies A., de Groot L., van Staveren W., Fluid

- intake of the elderly Europeans. *J. Nutr. Health and Aging*, 1997, 1(3), 151–155.
7. Kayser-Jones J., Shell E.S., Porter C., Barbaccia J., Factors contributing to dehydration in nursing homes: inadequate staffing and lack of professional supervision. *JAGS*, 1999, 47, 1187–1194.
 8. Kleiner S.M., Water: An essential but overlooked nutrient. *J. Am. Diet. Assoc.*, 1999, 99(2); 200–206.
 9. Kunachowicz H., Nadolna I., Przygoda B., Iwanow K., 1998, Tabele wartości odżywczej produktów spożywczych. Instytut Żywności i Żywienia, Warsaw (in Polish).
 10. Lindeman R.D., Romero L.J., Liang H.C., Baumgartner R.N., Koehler K.M., Garry P.J., Do elderly persons need to be encouraged to drink more fluids? *J. Gerontol. A Biol. Sci. Med. Sci.*, 2000, 55(7), M361–365.
 11. Pietruszka B., Zielińska E., Ocena spożycia wody oraz struktury spożywanych napojów przez osoby dorosłe. 2000, *In: Proceedings Kongres 2000 Polskiej Gospodarki Żywnościowej i Nauki o Żywieniu Człowieka*. Polska Inicjatywa Konsumpcyjna sp. z o.o., Warsaw, Poland, p. 27 (in Polish).
 12. Rikkert M., Hoefnagels W., Deurenberg P., Age related changes in body fluid compartments and the assessment of dehydration in old age. 1998, *In: Hydration and aging. Facts, Research and Intervention in Geriatrics Serie* (ed. Vellas B., Albarede J.L., Garry P.J.). Serdi Publisher Springer Publishing Company, New York, pp 13–32.
 13. Russel R.M., Rasmussen H., Lichtenstein A.H., Modified Food Guide Pyramid for people over seventy years of age. *J. Nutr.*, 1999, 129, 751–753.
 14. Simmons S.F., Alessi C., Schnelle J.F., An intervention to increase fluid intake in nursing home residents: prompting and preference compliance. *JAGS*, 2001, 49(7), 926–933.
 15. Steen B., Body water in the elderly. *J. Nutr. Health and Aging*, 1997, 1(3), 142–145.
 16. Szponar L., Wolnicka K., Rychlik E., 2000, Album of photographs of food products and dishes. National Food and Nutrition Institute, Warsaw.
 17. Wilson M.-M.G., The management of dehydration in the nursing home. 1998, *In: Hydration and aging. Facts, Research and Intervention in Geriatrics Serie* (ed. Vellas B., Albarede J.L., Garry P.J.). Serdi Publisher Springer Publishing Company, New York, pp. 181–200.
- Received August 2002. Revision received November 2002 and accepted January 2003.

OCENA DZIENNEGO SPOŻYCIA WODY I NAPOJÓW PRZEZ OSOBY STARSZE MIESZKAJĄCE W REGIONIE WARSZAWSKIM

Barbara Pietruszka, Magdalena Krajewska

Wydział Nauk o Żywieniu Człowieka i Konsumpcji, SGGW, Warszawa

Ocenę spożycia wody i napojów przeprowadzono wśród 206 starszych osób, losowo dobranych z trzech środowisk Warszawy i jej okolic: miejskiego, podmiejskiego i wiejskiego. Ocenę przeprowadzono metodą 3-dniowego bieżącego notowania. Przy ocenie brano pod uwagę wszystkie źródła wody (pożywienie stałe, napoje, wodę dodawaną w trakcie gotowania). Za napoje uważano wszystkie płyny spożywane w szklance lub filiżance. Dzielne pobranie wody ze wszystkich źródeł porównano ze standardem, obliczonym indywidualnie dla każdego respondenta na podstawie jego masy ciała. Natomiast ilość spożywanych napojów porównywano z zaleceniami podanymi w amerykańskiej piramidzie żywieniowej dla osób starszych.

Uzyskane wyniki wskazują na powszechne małe dzienne spożycie wody i napojów, szczególnie przez kobiety, osoby ze środowiska podmiejskiego i wiejskiego, ludzi o niższym poziomie wykształcenia i niższym statusie ekonomicznym. Realizacja standardu wynosiła przeciętnie u mężczyzn 70%, a u kobiet 64% (tab. 2). Ilość spożywanych napojów wynosiła średnio około 800 g, co stanowi zaledwie około 4 szklanki w porównaniu do 8 szklanek zalecanych w amerykańskiej piramidzie żywieniowej dla osób starszych.

Tak niewielkie spożycie wody ze wszystkich źródeł i napojów w ciągu dnia może stwarzać poważne problemy zdrowotne. Dlatego też ocenę spożycia wody i napojów należy uwzględnić we wszystkich badaniach oceny sposobu żywienia, co pomoże zidentyfikować osoby i grupy populacyjne z ryzykiem odwodnienia organizmu. Istnieje też konieczność uświadczenia osobom starszym, członkom ich rodzin, czy osobom opiekującym się nimi jak ważne jest dla zachowania dobrego stanu zdrowia spożywanie odpowiedniej ilości wody i napojów.