

Determining the Correlation Between Three and Seven Day Records of Fluids Consumption to Determine an Appropriate Method for Estimating the Amount and Type of Fluids Intake in Adults

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Abstract

Background: Different methods are used for adequate fluid intake assessment, while there is no standard method for adequate fluid intake assessment.

Objectives: The current pilot study aimed to evaluate the amount, type and frequency of fluids consumption to determine the correlation between three- and seven-day records.

Methods: This pilot cross-sectional study was done on 30 adult subjects in Ahvaz, Iran during year 2014. Demographic data were collected via a questionnaire and fluids consumption was assessed with a seven days records questionnaire. For data analyses the SPSS 16 software was used.

Results: Results of this cross-sectional study showed that the average total daily fluids consumption was 1.6 liter. Total fluids consumption for each subject on average in three and seven days was 4.5 and 11 liter, respectively. Water was the major fluid, which the participants consumed and tea was the second item. Total amount and frequency of fluids intake were not significantly different between three and seven-day records ($P = 0.287$), ($P = 0.546$).

Conclusions: This study showed that there was no significant difference between the record of seven and three days of fluids consumption in the participants and it is suggested that three-day records is useful in order to determine fluids intake.

Keywords: Fluids, Food Records, Water, Tea, Milk

1. Background

Water is the main component of our body that makes up to 60% of our body weight (1). Sources of origin of water include fluids such as water and beverages and also foods. Only a little amount of our body water is supplied from intracellular metabolic processes. Recommendation of fluid intake is different between countries, the US institute of medicine (IOM) recommended 3.7 and 2.7 liters of water intake for males and females, respectively (2). However, the European food safety authority (EFSA) recommended minimum water intake of 1 liter/1000 kcal (3). No recommendation for fluids intake has been announced for Iran. evaluation and correction of the pattern of fluid intake is important. In the recent decades in many countries fluids intake pattern has changed widely in children and adolescents (4-6); milk intake has decreased and intake of carbonated beverages, sweetened drinks and fruity drinks has increased (6, 7). Many studies showed a relationship be-

tween sweetened beverages and overweightness, obesity, metabolic and type 2 diabetes (8-10). Based on reports about fluids consumption, tea is the most popular fluid in the world after water (11). However, tea and coffee consumption is associated with more calorie intake (12).

Many studies have evaluated fluids consumption in different populations. The instrument for collecting data includes different questionnaires such as food frequency (FFQ), 24-hour recall or both FFQ and food recall, food record and biological markers (13-16). Mechanism assessment of fluids consumption is different in these studies. Also the questionnaires that were used in previous studies do not consider all types of fluids commonly consumed in populations. Because of variable types of fluids intake including industrial fluids and also different packaged fluids, as well as different volumes of fluids in communities, the actual daily intake of fluid consumption with simple FFQ or 24-hour recall has not been estimated. Crawford et

al. showed that three-day food records is the best choice compared to 24-hour recall and 5-day food frequency (17).

On the other hand, long time food record for participants in some studies increased accuracy and another studies cause elaborating and so increasing risk of error (18, 19). Under reporting and over reporting of food intake in short time assessment studies has been documented (20, 21).

2. Objectives

A standard and comprehensive method for evaluating fluids consumption has not yet been designated. Therefore the present pilot study evaluated amounts, types and frequency of fluids consumption to determine correlation between three- and seven-day records. The results of this study can be used for larger studies.

3. Methods

This was a cross-sectional pilot study. Thirty adult (30 years old and above) volunteers from Ahvaz city participated in this study. The data collection consisted of a demographic questionnaire and one weekly fluids consumption record questionnaire from the study of Abdollahi et al. (2011) (22). The demographic questionnaire included questions such as age, gender, education and job, while the records questionnaire included amounts, types and frequency of fluids consumption. For easy recording, the questionnaire was designed as a booklet and we asked our subjects to keep this booklet with themselves everywhere such as restaurant and coffee shop for one week. In order to reduce the risk of error, photos of types of fluids, including water, tea, sweetened beverage (sweetened and flavored commercial beverage), milk, dough, carbonated beverage, natural fluids juice, syrups (home-made sweet drinks), green tea, nonalcoholic beer and fluid containers that are commonly consumed in Iran, was annexed in the booklet. The participants were contacted during one week. Sample selection was random by visiting the homes of the population under study and obtaining their agreement regarding participation in the study. Inclusion criteria included minimum literacy to complete the questionnaire and exclusion criteria were fasting and following a special diet. At baseline there were thirty-five volunteer participants yet at the end of the study, data from thirty were included in the analysis as five were excluded, due to failure to complete data including types and amounts of fluids consumption, completion of questionnaire in less than six days and report of total fluids consumption of less than 400 mL in three days (22). The aim of this pilot study was evaluation of the correlation between three-

and seven-day records of fluids consumption. Types and amounts of fluids consumption were compared in three (including two days in the weekend) and seven days. Data was analyzed using the SPSS software. Data is presented in mean \pm standard deviation (SD). To study the correlation between three- and seven-day records we used the paired sample T test. P values of < 0.05 were considered significant.

4. Results

Table 1 shows distribution of subjects according to age, gender, education and employment status. Half of the participants were in the third grade of middle school to third year of high school and 23.3% had associate degrees. Seventy percent of the participants was unemployed and housekeepers and 10% were retired and the remainder was employed. Average total frequency of fluids consumption for seven and three days was 7.02 ± 2.10 and 6.80 ± 2.42 , respectively and average total amount of fluids consumption for seven and three days was 1596.30 ± 567.72 and 1533.45 ± 700.58 mL, respectively. Percentage of water consumption (from total fluids) was more for seven days than three days. There was no significant difference between three and seven days regarding the frequency and also amount of fluids consumption ($P = 0.287$ and $P = 0.546$). There was no significant difference between total amount of tea, carbonate beverage, dough, natural fruit juice, syrup and beer consumption between three- and seven-day records and thus these fluids consumption was equal between three and seven days. The greatest amount of fluid consumption was water followed by tea. Mean frequency and amount of all fluids consumption is shown in Table 2.

5. Discussion

Many studies surveyed fluids consumption in different countries. In most of the studies, collecting data was based on FFQ, 24-hour recall and seven days records. However collecting data in these studies almost not especially for fluids consumption and questioners also included food intake. In other hand, in these studies fluids intake were not evaluated in outside mealtime and only evaluated in mealtime (13-16, 23). Drewnowski et al. evaluated fluids consumption in adults using two non-consecutive 24-hour recalls, first by mobile examination center and second by telephone. Because of different scales for obtaining the data and self-reporting error, the risk of error was probably high (24).

In the current study to evaluate fluids consumption we used a comprehensive questionnaire. To increase accuracy

Table 1. Demographic Characteristics of Subjects

	Characteristics
Gender, No. (%)	
Males	7 (23.3)
Females	23 (76.7)
Age, mean \pm SD	
	42.7 \pm 1.17
Educational Status, No. (%)	
Primary	3 (10)
Third grade middle school to third year of high school	15 (50)
Associate degree	7 (23.3)
Bachelor of science and higher	5 (16.7)
Job Status, No. (%)	
Employed	6 (20)
Unemployed	21 (70)
Retired	3 (10)

and decrease risk of error, we designed a booklet including images of types and amounts of all fluids consumption in Iran. Assessment of fluids consumption in previous studies was based on interviews (25). Thus, the data probably involved under and overestimations. The comprehensive questionnaire in this study included questions on where and when fluids were consumed during the day for a week and fluids intake was recorded during seven days and the participants were contacted by phone for reminders. Therefore, the current study showed all daily fluids consumption of participants during one week. Some studies used biological markers to survey adequate fluids consumption. Biological markers included urine and serum or plasma osmolality (26-28). Although these biological assessments for the evaluation of adequate fluid intake were useful yet were not complete because they do not show type and amount of each fluid. Beside evaluation of the amount of fluids intake, type of fluids consumption is also important. The world health organization (WHO) expressed that sweetened beverages consumption is a possible cause for epidemic of obesity (29). While water consumption is related to healthy diet pattern and low calorie intake (30). In some cases increased water intake was associated with weight loss and maintenance of the lost weight (31, 32). Therefore, drinking water instead of sweetened beverages consumption could be a strategic way for lower calorie intake and weight loss. Some studies suggested that non-sweetened beverages consumption, especially water, prevents kidney stone recurrent. On the other hand, carbonated and caffeinated beverages due to

replacement with milk and increasing urinary calcium excretion can lead to bone fractures (33, 34). According to the increasing risk of osteoporosis in middle and older adults, this issue is important (35). Therefore, biological marker as a complement instrument with a comprehensive questionnaire to studied fluids consumption can be appreciable.

The present study indicated that mean of the amount of fluids consumption was 11 and 4.5 liters in seven and three days, respectively. The WHO recommended daily amount of fluids intake of 2.2 liters for females and 2.9 liters for males (36). In this study, the mean daily fluids intake was 1.6 liters. This study indicated that mean daily fluids intake in Ahvaz citizen was less than the WHO recommendations. Despite the importance of drinking water and fluids on human health, there is still no consensus about the amount of daily water intake. The mean daily fluids intake for one study from Tehran city was reported as 1.9 liters, while for England and China this was 2.33 and 1.76 liters, respectively (11, 18, 22). The current study indicated that the percentage of the amount of water intake from total fluids consumption in one day was 7.4% according to the three-day report, and 15.6% in one week. The American panel of beverages consumption guide (2006), according to energy and nutrients content, recommended the ranking of a variety of fluids for above six-year olds, in the following order, drinking water then tea and coffee, skim and low fat milk, soy milk, non-caloric sweetened beverages, fruit and vegetable juice and whole milk (37). In the present study, the pattern of fluid consumption was somewhat similar to this recommendation (water, tea, natural fruit juice, milk, green tea, soda, dough, carbonated beverages, non-alcoholic beer and sweetened beverages).

The purpose of the current pilot study was to evaluate the correlation between three- and seven-day records of fluids consumption. This study showed there was no significant difference between these records. This study showed that for evaluation of fluids consumption, we can use a three-day record as well.

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Table 2. Average Amount and Frequency of Different Fluids Consumption in Subjects^{a,b}

Fluids Type	Average Frequency of Fluid Consumption in Seven-Day Records, Mean \pm SD	Average Frequency of Fluid Consumption in Three-Day Records, Mean \pm SD	Correlation of the Frequency of Fluid Consumption Between Seven- and Three-Day Records, P value	Average Amount of Fluid Consumption in Seven-Day Records, mL, Mean \pm SD	Average Amount of Fluid Consumption in Three-Day Records, mL, Mean \pm SD	Correlation of the Amount of Fluid Consumption Between Seven and Three Days Records, P value
Water	3.6 \pm 2.14	3.21 \pm 1.80	0.000	931.77 \pm 604.50	773.11 \pm 441.38	0.026
Tea	2.51 \pm 1.44	2.25 \pm .97	0.034	773.11 \pm 441.38	399.65 \pm 232.37	0.653
Sweetened Beverage	0.48 \pm 0.41	0.69 \pm 0.52	0.004	106.87 \pm 97.88	174.09 \pm 145.05	0.001
Milk	0.60 \pm 0.39	0.74 \pm 0.38	0.081	136.96 \pm 83.30	185.64 \pm 39.100	0.006
Dough	0.38 \pm 0.16	0.50 \pm 0.23	0.131	102.76 \pm 45.04	126 \pm 45.10	0.898
Carbonated Beverages	0.28 \pm 0.07	0.44 \pm 0.17	0.541	102.76 \pm 45.04	93.88 \pm 41.76	0.462
Natural Fluid Juice	0.71 \pm 0.46	0.77 \pm 0.50	0.000	167.14 \pm 89.33	187.77 \pm 120.75	0.073
Syrup	0.25 \pm 0.16	0.40 \pm 0.14	1.000	55.45 \pm 22.37	93.83 \pm 28.34	0.874
Green Tea	0.57 \pm 0.40	0.66 \pm 0.47	0.000	36.25 \pm 16.77	86.11 \pm 47.79	0.00
Nonalcoholic beer	0.40 \pm 0.23	0.60 \pm 0.27	0.196	98.57 \pm 79.02	143 \pm 94.57	0.112
Total	7.02 \pm 2.10	6.80 \pm 2.42	0.287	1596.30 \pm 567.72	1533.45 \pm 700.58	0.546

^aValues are expressed as mean \pm Standard Deviation (SD).

^bP value of paired sample T test was used for statistical analysis. P< 0.05 was considered significant

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