

Research and Professional Briefs

Factors Associated with Low Drinking Water Intake among Adolescents: The Florida Youth Physical Activity and Nutrition Survey, 2007

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ABSTRACT

There is limited information on which characteristics are associated with water intake among adolescents. This cross-sectional study examined the association between demographic, dietary, and behavioral factors and low water intake as the outcome measure. Analyses were based on the 2007 Florida Youth Physical Activity and Nutrition Survey using a representative sample of 4,292 students in grades six through eight in 86 Florida public middle schools. Multivariable logistic regression was used to calculate adjusted odds ratios (ORs) and 95% confidence intervals for factors associated with low water intake (<3 glasses water per day). About 64% of students had low water intake. Factors significantly associated with low water intake were Hispanic ethnicity and non-Hispanic other (vs non-Hispanic white; ORs 0.79 and 0.76, respectively), drinking no 100% juice, drinking it <1 time/day, and drinking it 1 to 2 times/day (vs drinking it ≥ 3 times/day; ORs 1.83, 1.91, and 1.32, respectively), drinking no milk and drinking <2 glasses of milk/day (vs drinking ≥ 2 glasses/day; ORs 1.42 and 1.41, respectively), drinking <1 soda/day (vs drinking none; OR 1.40), drinking fruit-flavored drinks/sports drinks <1 time/day and drinking it ≥ 1 time/day (vs drinking none; ORs 1.49 and 1.41, respectively), eating at a fast-food restaurant ≥ 3 days/week (vs none; OR 1.38, respectively), not participating on team sports or participating on 1 to 2 team

sports in previous 12 months (vs participating on ≥ 3 teams; ORs 1.77 and 1.24, respectively), and consuming snack/soda while watching television/movies “sometimes” and “most/every time” (vs never; ORs 1.65 and 2.20, respectively). The strongest factor associated with low water intake was frequent consumption of snacks/sodas while watching television/movies. Although study findings should be corroborated in other states and in a nationally representative sample, they may be useful in targeting adolescents for increased water consumption.

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The prevalence of childhood obesity has increased substantially in the United States (1,2) and is a major public health concern because of morbidities associated with it (3-5). High consumption of sugar drinks has been associated with obesity among youth (6-10). Sugar drinks are the largest source of added sugar (11) and account for 7.1% of total energy in the average US diet (12). Given that the average energy intake among US youth has increased during the past few decades, particularly from sugar drinks (13,14), the substitution of drinking water for sugar drinks might help them to maintain a healthier weight (10,15).

Adequate water consumption is important in preventing dehydration, which has been associated with adverse health outcomes, including certain cancers (16,17), coronary heart disease (16), kidney stones (16), and severe bronchopulmonary disorders (18). Although total water intake requirements can be met by consuming beverages and foods, drinking water is a zero-energy, thirst-quenching option (16) that obviously will not promote obesity.

The adequate intake (AI) level for water in any form (foods, beverages, and drinking water) was established by the Institute of Medicine as a guide for preventing adverse effects of dehydration rather than for decreasing risks for chronic diseases (16). Specific AI levels vary by sex and age. The AI levels for total water are 2.4 L/day, including 1.8 L (≈ 8 c) in the form of water or other beverages for boys 9 to 13 years of age and 3.3 L/day, including 2.6 L (≈ 11 c) as beverages for boys 14 to 18 years of age. The AI levels for total water are 2.1 L/day, including 1.6 L (≈ 7 c) in the form of water or other beverages for girls 9 to 13 years of age and 2.3 L/day, including 1.8 L (≈ 8 c) as beverages for girls 14 to 18 years of age. People who are physically active or living in hot climates require even more water (16). However, based on the 2005-2006 National Health and Nutrition Examination Survey (NHANES), the average total water intake

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among US youth (aged 12 to 19 years) was 2.4 L/day (1.6 L/day from food and beverages other than drinking water and 0.8 L/day in plain water) (19).

Although many studies have examined the association of sugar drink consumption with various demographic and behavioral factors (14,20,21), few have examined the association between drinking water consumption and these factors. Some studies have shown possible associations between water intake and factors such as age, race/ethnicity, education level, and physical activity among young children (22-24) or adults (25-27). However, there is limited information on the extent to which demographic and behavioral factors are associated with water intake among adolescents (19,26). Both societal norms/culture/behaviors and individual knowledge/attitudes influence behaviors associated with weight status, so it is possible that low intake of drinking water may be associated with other less-healthy behaviors, such as high consumption of sugar drinks, excessive screen time, and low levels of physical activity. This is a potential link between low water consumption and obesity. The purpose of this cross-sectional study was to assess associations between low drinking water intake and demographic, dietary, and behavioral factors among Florida adolescents.

METHODS

This cross-sectional study was based on the Florida Youth Physical Activity and Nutrition Survey (YPANS), conducted in spring 2007. YPANS, developed by the Florida Department of Health, was a statewide, self-reported, school-based survey of public middle school students. YPANS monitored attitudes, health behaviors, and knowledge of physical activity and nutrition among students (28). YPANS used questions from the Centers for Disease Control and Prevention Youth Risk Behavior Surveillance System, which had previously been validated (29,30).

The eligible population for the survey included all Florida regular public middle school students in grades six through eight. The population was stratified by region and sampled systematically proportional to enrollment in grades six through eight. Within schools, either all classes meeting during a particular period of day or all classes in a required subject were included in the sampling frame. Systematic equal probability sampling was used to select classes from each school that participated in the survey. All students in selected classes were included in the sample. Every fourth student in selected classes was asked to complete the survey.

Consent forms from parents (passive consent in most cases) and assent from students were obtained before the survey was administered. Because these analyses involved existing deidentified data, this study was exempt from the Centers for Disease Control and Prevention Institutional Review Board process.

A total of 4,669 students in grades six through eight from 86 Florida middle schools completed the 2007 survey. However, 377 respondents were excluded because of missing data for the outcome variable. The final analytic sample was 4,292 respondents. The estimated overall response rate for the Florida YPANS was 70%, based on

the number of schools that participated and the number of eligible students.

Outcome Variable

The outcome of interest was water intake. Students were asked, "During the past 7 days, how many glasses or bottles of water did you drink?" For χ^2 tests, the outcome variable was categorized into drinking <1 glass water per day, 1 to 2 glasses water per day, or ≥ 3 glasses water per day. For the logistic regression analyses, the outcome variable, low water intake, was defined as drinking <3 glasses water per day, based on the findings from a previous study done in youth (19) and the data distribution from our study.

Exposure Variables

Student characteristics were examined. Demographic variables were age (12 years or younger, 13 years, and 14 years or older), sex, race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, and other). Other characteristics were self-reported academic grades (A, B, C, and D/F) and intention to control weight (trying to lose weight, trying to gain weight, trying to stay the same weight, and not trying to do anything about weight). Dietary variables (reported consumption during the previous 7 days) were frequency of 100% fruit juice consumed per day (none, <1, 1 to 2, and ≥ 3), glasses milk consumed per day (none, <2, and ≥ 2), sodas consumed per day (none, <1, and ≥ 1), frequency of fruit-flavored drinks or sports drinks consumed per day (none, <1, and ≥ 1), number of breakfasts eaten (none, 1 to 6, and 7), and days in which fast food was eaten (none, 1 to 2, and ≥ 3). Behavioral characteristics were team sports participation during the past year (none, 1 to 2 teams, ≥ 3 teams), individual sports participation during the past year (none, 1 to 2 sports, and ≥ 3 sports), time spent watching television on an average school day (none, ≤ 2 hours, and ≥ 3 hours), time spent watching television on an average weekend day (none, ≤ 2 hours, 3 to 4 hours, and > 4 hours), and frequency of snack or soda consumption while watching television or movies (never, sometimes, and most/every time). Unknown values or missing data regarding exposure variables ranged from 0.3% to 16% and were excluded from analysis when the variable was used.

Statistical Analysis

Data were weighted by sex, grade, and region to represent all Florida public middle school students in grades six through eight. Descriptive statistics were expressed as proportions. χ^2 tests were used to examine differences across categories. Odds ratios (ORs) and 95% confidence intervals for low drinking water intake were calculated using multivariable logistic regression. Because of significant correlation between team sport participation and individual sport participation, we used only team sport participation in the logistic regression model. Of note, there were no confounding effects of the various beverages included in the study on low water intake. Age, sex, plus all variables that were significantly associated with water intake based on χ^2 tests were included in the initial logistic regression model development. However, vari-

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