



Contents lists available at ScienceDirect

Journal of the American Pharmacists Association

journal homepage: [www.japha.org](http://www.japha.org)

## RESEARCH NOTES

## Knowledge of appropriate acetaminophen use: A survey of college-age women

Janice L. Stumpf\*, Allison C. Liao, Stacy Nguyen, Amy J. Skyles, Cesar Alaniz

## ARTICLE INFO

## Article history:

Received 26 February 2017

Accepted 20 September 2017

## ABSTRACT

**Objectives:** To evaluate college-age women's knowledge of appropriate doses and potential toxicities of acetaminophen, competency in interpreting *Drug Facts* label dosing information, and ability to recognize products containing acetaminophen.

**Methods:** In this cross-sectional prospective study, a 20-item written survey was provided to female college students at a University of Michigan fundraising event in March 2015.

**Results:** A total of 203 female college students, 18–24 years of age, participated in the study. Pain was experienced on a daily or weekly basis by 22% of the subjects over the previous 6 months, and 83% reported taking acetaminophen. The maximum 3-gram daily dose of extra-strength acetaminophen was correctly identified by 64 participants; an additional 51 subjects indicated the generally accepted 4 grams daily as the maximum dose. When provided with the Tylenol *Drug Facts* label, 68.5% correctly identified the maximum amount of regular-strength acetaminophen recommended for a healthy adult. Hepatotoxicity was associated with high acetaminophen doses by 63.6% of participants, significantly more than those who selected distracter responses ( $P < 0.001$ ). Knowledge of liver damage as a potential toxicity was correlated with age 20 years and older ( $P < 0.001$ ) but was independent from race and ethnicity and level of alcohol consumption. Although more than one-half of the subjects (58.6%) recognized that Tylenol contained acetaminophen, fewer than one-fourth correctly identified other acetaminophen-containing products.

**Conclusion:** Despite ongoing educational campaigns, a large proportion of the college-age women who participated in our study did not know and could not interpret the maximum recommended daily dose from *Drug Facts* labeling, did not know that liver damage was a potential toxicity of acetaminophen, and could not recognize acetaminophen-containing products. These data suggest a continued role for pharmacists in educational efforts targeted to college-age women.

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An estimated 100 million American adults have chronic pain, with women affected more frequently than men.<sup>1,2</sup> Common causes of pain in women include menstrual pain and muscle aches. In addition, migraines and severe headaches occur in women twice as often as in men.<sup>3</sup> Consequently,

**Disclosure:** The authors have no conflicts to disclose regarding this research.  
**Funding:** This research was supported by a Student Award Program grant from the Blue Cross Blue Shield of Michigan Foundation. The sponsor had no involvement in study design; collection, analysis, or interpretation of data; or writing this report.

**Previous presentation:** Poster at American Society of Health-System Pharmacists Midyear Clinical Meeting, December 2015.

\* **Correspondence:** Janice L. Stumpf, PharmD, University of Michigan Center for Medication Use Policy, Michigan House—Room 2202, 2301 Commonwealth Blvd., Ann Arbor, MI 48105-2967.

E-mail address: [jlstumpf@umich.edu](mailto:jlstumpf@umich.edu) (J.L. Stumpf).

women are more likely than men to use both prescription and nonprescription analgesics and to use multiple analgesics simultaneously.<sup>2,4</sup>

In a 2002 study of 2590 participants, the analgesic acetaminophen was the most commonly used medication.<sup>5</sup> Overall, 28% of women 18–44 years of age used acetaminophen in the preceding week, representing the highest rate of all subpopulations. More recently, a review of prescription claims data from 2008 to 2012 noted that 23.8% of women 20–24 years of age and 29.6% of women 25–29 years of age filled a prescription for an opioid analgesic.<sup>6</sup> Hydrocodone, at that time available only in combination with acetaminophen (Vicodin [Abbvie] and generics), was the most commonly dispensed opioid agent in 17.5% of privately insured and 25.0% of Medicaid-enrolled women 15–44 years of age.

Acetaminophen is an ingredient in more than 600 single- and multi-ingredient prescription and nonprescription products.<sup>7</sup> Liver damage is a known consequence of acetaminophen ingestion when doses exceed 4 grams daily.<sup>7,8</sup> In fact, acetaminophen overdose is the most common cause of acute liver failure in the United States, resulting in an estimated 26,000 hospitalizations and 450 deaths each year, according to a 2006 report.<sup>9</sup> One-half of the cases of acute liver failure result from misuse (i.e., doses higher than recommended or too frequent in an attempt to bring relief more quickly) or inadvertent ingestion of multiple acetaminophen-containing products simultaneously.<sup>7,10,11</sup>

Previous studies have demonstrated the need for education regarding the safe use of acetaminophen.<sup>12–24</sup> In 2009, the Food and Drug Administration (FDA) required that medications be labeled more prominently to highlight acetaminophen content.<sup>25</sup> In addition, the *Drug Facts* label must now include the potential for acetaminophen-induced liver toxicity from taking more than the recommended dose, using multiple products containing acetaminophen simultaneously, or ingesting the medication with moderate amounts of alcohol. Over the past decade, public education campaigns targeting acetaminophen have been launched by FDA, the manufacturers of Tylenol (McNeil) and other acetaminophen-containing products, and the Acetaminophen Awareness Coalition, a group of health and consumer organizations advised by FDA, the Center for Disease Control and Prevention, and the American Academy of Pediatrics.<sup>7,8,25–27</sup>

## Objectives

Studies to date have not focused on younger women, despite their high prevalence of pain and medication use patterns. The objectives of the present study were to evaluate female college students' knowledge of appropriate doses and potential toxicities of acetaminophen, competency in interpreting dosing information correctly from a *Drug Facts* label, and ability to recognize products containing acetaminophen.

## Methods

### Population and survey instrument

Female college students 18 years of age and older were recruited for this prospective cross-sectional study at a campus fundraising event in March 2015. Inclusion criteria included the ability to read and understand English. Excluded were those under 18 years of age or unable to complete the survey because of obvious cognitive disability as assessed by the investigator providing the survey.

The survey instrument consisted of 20 multiple-choice and open-ended questions written at the 8th grade level according to the Flesch-Kincaid Grade Level Test ([Appendix 1](#), available at [JAPhA.org](#) as supplemental content). Areas surveyed included demographics (e.g., age, education, race and ethnicity, ethanol intake), use of acetaminophen and other analgesics, knowledge of toxicities and recommended maximum daily dose of acetaminophen, and ability to interpret Tylenol *Drug Facts* labeling. Five laypersons had completed the survey to assess face validity and readability. Feedback regarding ease of completion and survey clarity was sought and revisions made before enrolling subjects.

Women attending the 1-day fundraising event were personally invited to complete the written survey until at least 200 surveys were completed in this convenience-sampling methodology. After survey completion, participants were offered information provided online by the Acetaminophen Awareness Coalition ([knowyourdose.org](#)) to serve as educational interventions.<sup>7</sup> As an incentive, participants could enter a raffle for a \$25 Amazon gift card. All procedures were in accordance with Health Insurance Portability and Accountability Act regulations. Exemption was obtained from the University of Michigan Health Sciences and Behavioral Sciences Institutional Review Board.

### Data analysis

The primary end points of this study were the percentage of female college students who were knowledgeable about appropriate acetaminophen doses and potential toxicities, could recognize products containing acetaminophen from a list, and could correctly interpret Tylenol *Drug Facts* label dosing information.

Descriptive statistics were used to represent the study population, including age, race or ethnicity, level of education, past or present diagnosis of liver disease, and ethanol ingestion. Categorical data were reported as absolute numbers and percentages. Chi-square test and McNemar test were used to analyze categorical data. A *P* value of  $\leq 0.05$  was considered to be significant for all analyses.

## Results

### Demographic characteristics

Overall, 203 subjects participated in the survey ([Table 1](#)). The mean age of respondents was  $19.2 \pm 1.1$  years (range 18–24

**Table 1**  
Demographic characteristics of participants (n = 203), n (%)

Age, y, mean $\pm$ SD	19.2 $\pm$ 1.1
Race and ethnicity	
White	166 (81.8)
African American	3 (1.5)
Asian	21 (10.3)
Hispanic or Latino	4 (2.0)
American Indian or Alaskan Native Tribe	1 (0.5)
Other	8 (3.9)
Level of education	
Undergraduate	200 (98.5)
Graduate	3 (1.5)
Alcohol ingestion	
Never	51 (25.9)
1 drink per d 1–7 days per wk	56 (28.4)
2 drinks per d 1–3 d per wk	36 (18.3)
2 drinks per d 4–7 d per wk	5 (2.5)
3 or more drinks per d 1–3 days per wk	45 (22.8)
3 or more drinks per d 4–7 days per wk	4 (2.0)
Experienced pain in previous 6 mo	44 (21.7)
Frequency of acetaminophen use	
Never	27 (13.3)
$\leq 1$ time per wk	148 (72.9)
2–6 times per wk	16 (7.9)
1–2 times per d	3 (1.5)
2–4 times per d	1 (0.5)
Unsure	8 (3.9)

Not all subjects responded to each question.

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