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College students' use of strategies to hide facial flushing: A target for alcohol education

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Abstract

Objective: Alcohol-related facial flushing occurs in individuals who are unable to metabolize ethanol effectively and is associated with increased cancer risk. This study describes college students' understanding of the meaning of flushing for how much alcohol a person should drink and their use of over-the-counter medications and other strategies to reduce its visible effects.

Participants: The sample includes 335 White and Asian college students who reported facial flushing after an alcoholic drink.

Methods: Students completed an online survey in the spring of their junior year.

Results: Most students reported that flushing had no special meaning for drinking or that they did not know what it meant. Six percent reported ever using strategies to hide facial flushing; they were mostly Asian, and those using these strategies drank more alcohol.

Conclusions: Findings identify a need for targeted alcohol education with Asian college students who drink alcohol despite experiencing the flushing response.

Keywords

alcohol-related facial flushing; college students; meaning of flushing; flushing suppression strategies

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The alcohol flushing response is an adverse reaction to the metabolism of ethanol,¹ which occurs when deficient enzymes for metabolizing ethanol result in a buildup of acetaldehyde in the body.² Alcohol-related flushing has a genetic basis. Two genetic markers associated with flushing are *ADH1B**2 and *ALDH2**2. They have different mechanisms affecting flushing; *ADH1B**2 initiates a faster metabolism of ethanol to acetaldehyde whereas *ALDH2**2 has a slower metabolism of acetaldehyde to acetate. The frequency of these genetic markers varies across populations groups. *ADH1B**2 is found in 80% or more of northeast Asians (Chinese, Japanese, and Koreans) and about 10% of individuals of European ancestry.¹ The *ALDH2**2 variant is found almost exclusively in people of northeast Asian descent with the prevalence varying across specific Asian groups.¹

The aforementioned buildup of acetaldehyde (a toxic compound) is associated with several discomforts while drinking alcohol, including increased skin temperature, feeling hot and reddening of the face, increased heart and respiration rate, nausea, and headache.³ Studies show that these discomforts are not always enough to prevent risky alcohol consumption among individuals who experience alcohol-related flushing, including college students.⁴⁻⁶ The result for those who continue to drink despite experiencing facial flushing is an increased exposure to acetaldehyde and the associated risk for serious health consequences. Even light drinking, for individuals who carry the *ALDH2**2 genetic marker, is associated with a higher risk for head and neck cancers.⁷ *ALDH2**2 carriers who drink are also more prone to liver disease and pancreatitis.¹ College students of European ancestry who carry the *ADH1B**2 variant report more intense or unpleasant reactions, like headaches, at low levels of drinking;⁸ however, evidence for *ALDH2*'s association with cancer and other diseases is stronger than for *ADH1B*.¹

It could be that college students do not understand the meaning of facial flushing as an indication of the body's inability to metabolize alcohol effectively. A study conducted in China found that most university students (59.3%) did not realize that flushing indicates that one should lessen or halt alcohol consumption.⁹ Some college students passively ignore flushing symptoms or actively seek to hide the visible effects. A report described U.S. Asian students using over-the-counter medications to inhibit the flushing response.¹⁰ Strategies to reduce the observable symptoms of alcohol facial flushing can be easily found online; suggested strategies include taking antihistamines, allergy medications, herbal remedies, or using green-tinted makeup to cover a reddened face.^{11,12}

The goals of this brief report are to examine college students' knowledge about the meaning of alcohol facial flushing and their use of over-the-counter medication and other strategies to inhibit flushing reactions. To our knowledge, this is the first empirical study to examine these topics in a U.S. college student sample. We expect that students who report that facial flushing has no significant meaning for alcohol consumption or who actively use strategies to hide facial flushing will consume more alcohol compared to students who do not.

Methods

Participants

Participants were 335 Asian and White undergraduate college students from a larger, longitudinal study examining genetic, environmental, and developmental influences on substance use and mental health during the college years and beyond.¹³ Students were recruited from a large, public university in the U.S. mid-Atlantic region. All incoming first-year students received an email invitation to complete an on-line survey in their fall semester. Follow-up surveys were conducted each consecutive spring. Data for the current study were from students who completed a survey in their junior year. Those who reported ever drinking alcohol responded to two questions about alcohol-related facial flushing based on earlier work by Yokoyama et al.¹⁴ Selected participants reported either a tendency in the one to two years after drinking onset or a current tendency to flush in the face immediately after having an alcoholic drink. White students were included to serve as a reference group. Students of other racial/ethnic groups represented in the full college survey were excluded because *ADH1B**2 and *ALDH2**2 frequencies are too rare.

Measures

Demographics.—Variables included age in years, male and female gender, and Asian or White race. Students of Asian descent identified their Asian subgroup, to include Asian Indian, Chinese, Filipino, Japanese, Korean, Vietnamese, or other Asian. Participants selecting more than one Asian subpopulation were included in the other Asian group.

Meaning of flushing.—Participants responded to the question, “What do you think it means when a person flushes while drinking alcohol?” by selecting from 1 of 3 response categories or I don’t know.¹⁵ Response categories included: (a) flushing means that a person should stop drinking, (b) could drink more alcohol, or (c) has no special meaning for drinking.

Strategies to inhibit facial flushing.—Participants reported whether they (1) ever heard about or (2) ever used over-the-counter medications or other practices to inhibit the flushing response. They responded yes or no to questions about four types of strategies, including taking heartburn medication (e.g., Pepcid AD, Zantac, Tagamet), allergy medication (e.g., Claritin, Allegra), an herbal or dietary supplement, or using some other practice to hide facial flushing. Students also indicated how they first learned about these practices, with response options being (a) parent, (b) brother or sister, (c) other family member, (d) friend, (e) online source (social media or internet search), or (f) other.

Grams of ethanol consumed per month measured students’ alcohol consumption. It was calculated as the product of separate measures of drinking frequency and quantity in the last 30 days, which was then multiplied by 14 to represent the grams of ethanol in one standard drink. For frequency, participants reported how often they have a drink containing alcohol: 0=never; 1=monthly or less; 2=2 to 4 times a month; 3=2 to 3 times a week; and 4=4 or more times a week. For quantity, they reported the number of drinks containing alcohol consumed on a typical day when drinking, ranging from: 0=0 drinks; 1=1–2; 3=3–4; 4=5–6;

5=7–9; and 6=10 or more drinks. Each of these ranges were converted to the median of the described range using a procedure describe elsewhere.¹⁶

Data analysis

Univariate and bivariate statistics (*t* tests, chi-square, and Fisher's exact with expected frequencies <5) describe the study sample and examine simple associations between alcohol flushing related variables (meaning of flushing and use of flushing suppression strategies) and demographic variables, i.e., age, gender, and race. A subsequent analysis used the subset of students who identified their race as Asian (*n*=130) to examine Asian sub-group differences. A general linear model (GLM) assessed the association of (1) student responses about the meaning of flushing and (2) their use of strategies to hide facial flushing with their monthly alcohol consumption, after controlling for race, gender, and age. To address the positive skewness in the alcohol consumption variable, we report median monthly drinking levels and use a natural log transformed variable for the GLM analysis.

Results

Characteristics

Based on participants who reported ever flushing (see Total column in Table 1), the sample was majority female and on average 21 years old, with more than 60% identifying their race as White. Participants who identified as Asian were primarily Filipino, Chinese, and Vietnamese, or identified 'other' Asian subgroups. One-fourth of Asian students were Korean, Japanese, and Asian Indian.

Meaning of flushing

Most students in the sample indicated that facial flushing had no meaning for drinking (30.0%) or reported that they do not know what it meant (44.2%). Approximately a quarter of students responded that it meant a person should stop drinking (22.7%), while fewer thought a person could drink more (3.0%). Table 1 presents reports about the meaning for facial flushing after drinking by demographic characteristics. Students' reports were significantly associated with gender and race, but not age. For example, more males indicated that flushing meant the drinker could continue to drink more or has no special meaning for drinking, while more females indicated they do not know what flushing after drinking means. While more Whites reported they did not know the meaning of flushing, one fourth of Asian students also did not know. More Asians than Whites indicated that flushing means a person should stop drinking. Differences across Asian subgroups were also significant. The majority (>50%) of Japanese and Vietnamese students reported that flushing was an indication that a person should stop drinking, while the majority of all other Asian subgroups indicated that it either had no special meaning or they didn't know the meaning.

Strategies to inhibit flushing

Fifteen percent (14.6%, *n*=47) of students heard about taking over-the-counter medications or using other strategies to hide the flushing response. Of those students, 42.6% first learned about this from a friend, 34.0% an online source, 17.1% a family member (4.3% parent, 8.5% sibling and 4.3% other family member), and 6.4% 'other' sources. Only 6.0% (*n*=20)

of students reported ever using such strategies, with 3.3% reporting the use of heartburn medication, 1.5% allergy medication, 1.2% herbal or dietary supplement, and 0.9% another approach. The use of one or more of these practices to reduce alcohol-related flushing was significantly associated with race ($p<.001$), but not with gender (males: 7.69%; females: 6.02%, $p=.647$) or age ($p=.243$). Fourteen percent of Asians ($n=16$, 14.04%) used flushing suppression strategies compared to 3.51% of Whites ($n=4$). Most of these Asian students were Vietnamese (43.8%), Filipino (25.0%), or Japanese (12.5%) with smaller percentages being Korean, Asian Indian, and other Asian (each 6.3%) ($p=.033$ Fisher's exact test). No Chinese students reported using these practices.

Model predicting alcohol consumption

Both students' thoughts about the meaning of flushing and having ever used strategies to reduce facial flushing were significantly associated with the amount of alcohol consumed. Compared to students who reported, "flushing means a person should stop drinking" (i.e., the reference group; $Mdn=63.0$ grams of ethanol consumed/month), students reporting all other meaning-of-flushing categories drank more alcohol. These comparisons were statistically significant (No special meaning: $Mdn=147.0$; $B=0.55$, $SE=.227$ and $p=.016$; and Don't know meaning: $Mdn=147.0$; $B=0.68$, $SE=.219$ and $p=.002$), except for students who thought a person could drink more ($Mdn=185.9$; $B=0.83$, $SE=.503$ and $p=.101$). This trend-level finding is likely due to the small size of this could-drink-more group ($n=10$, see Table 1). Additionally, those students who used flushing suppression strategies drank more alcohol ($Mdn=185.9$) when compared to those who did not ($Mdn=147.0$) ($B=0.95$, $SE=.349$ and $p=.007$). Race and gender were significantly associated with alcohol consumption in the model, while age was not ($B=-0.26$, $SE=.228$ and $p=.251$). Asians ($B=-0.73$, $SE=.179$ and $p<.001$) and females ($B=-0.46$, $SE=.203$ and $p=.024$) drank significantly less, respectively, than Whites and males.

Comment

An earlier study of Japanese and Japanese-Americans showed that embarrassment about the observable effects of flushing was associated with drinking less.¹⁷ In the current study, we considered whether alcohol consumption increases when students actively suppress flushing's visible effects. We showed that using strategies to suppress facial flushing, while infrequent, was positively associated with alcohol consumption. Asian students more than White students used these strategies, which is not surprising given that genetic markers linked to the flushing response are more frequent in this population.¹

Our results identified an important learning opportunity with college students to improve their understanding of the meaning of flushing. Similar to findings by Newman et al.¹⁵ in a university sample in China, we found that most students did not understand that alcohol-related flushing indicates a person should reduce or stop drinking. It is particularly important for university health professionals to increase Asian students' awareness of the link between alcohol facial flushing and cancer and other diseases.¹⁰ Students also might not know that taking antihistamines (i.e., H2 blockers) before drinking alcohol is problematic because it alters ethanol metabolism and raises the blood alcohol level.¹⁸ Web-based interventions have

had some success in college students. U.S. students with *ALDH2**2 reduced their drinking after receiving information on alcohol-related cancer,¹⁹ and students in China were more willing to tell another student who flushes that they should stop drinking.²⁰

Limitations

Our screening questions for identifying individuals who flush are reliable proxies for *ALDH2* deficiency in Asians,¹⁴ but may be less sensitive in ethnically diverse samples. We generated the current findings from a single U.S. institution, and they require examination in larger college samples to assess generalizability. This would also allow for a more complete examination of Asian subgroup differences as well as the factors associated with students' use of strategies to hide facial flushing. Studies could examine level of peer drinking and whether Asian students are U.S. born, which are also associated with greater alcohol consumption.^{5,21}

Conclusions

This study shows that college students who flush in the face after consuming alcohol are not well aware of the meaning of flushing to how much alcohol a person should drink. It provides empirical evidence of college students' use of strategies to suppress the visible effects of facial flushing as well as its relationship to increased alcohol consumption, and points to a topic for targeted alcohol education in Asian college students who flush after drinking.

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Table 1

Demographics and associations with students' reports of the meaning of facial flushing after drinking

	<u>Total sample</u> % (n)	<u>Meaning of flushing</u>				<i>p</i>
		Should stop % (n)	Could drink more % (n)	No special meaning % (n)	Don't know % (n)	
<u>Gender</u>						.005
Female	79.0% (264)	22.8% (59)	1.5% (4)	28.2% (73)	47.5% (123)	
Male	21.0% (70)	22.9% (16)	8.6% (6)	37.1% (26)	31.4% (22)	
<u>Race/Ethnicity</u>						<.001
Asian	38.8% (130)	34.9% (44)	3.2% (4)	36.5% (46)	25.4% (32)	
White	61.2% (205)	15.2% (31)	2.9% (6)	26.0% (53)	55.9% (114)	
<u>Asian subgroups</u>						.016 ^a
Asian Indian	6.2% (8)	37.5% (3)	12.5% (1)	25.0% (2)	25.0% (2)	
Chinese	18.5% (24)	25.0% (6)	8.3% (2)	45.8% (11)	20.8% (5)	
Filipino	23.8% (31)	20.7% (6)	0.0% (0)	27.6% (8)	51.7% (15)	
Japanese	6.9% (9)	75.0% (6)	0.0% (0)	12.5% (1)	12.5% (1)	
Korean	10.8% (14)	35.7% (5)	0.0% (0)	57.1% (8)	7.1% (1)	
Vietnamese	17.7% (23)	52.2% (12)	0.0% (0)	39.1% (9)	8.7% (2)	
Other Asian	16.27% (21)	30.0% (6)	5.0% (1)	35.0% (7)	30.0% (6)	
<u>Mean age</u>	21.0 (.364)	20.9 (.329)	20.8 (.249)	20.9 (.348)	21.0 (.393)	.489

Notes:

^a Fisher's exact test used when expected frequencies < 5.