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Contents

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ORIGINAL ARTICLE

Basic Study

Alcohol intolerance and myalgic encephalomyelitis/chronic fatigue syndrome

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Abstract

BACKGROUND
The literature is mixed about the occurrence of alcohol intolerance among patients with myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS). Surveys that asked respondents with ME/CFS whether they experienced alcohol intolerance within a recent time frame might produce inaccurate results because respondents may indicate that the symptom was not present if they avoid alcohol due to alcohol intolerance.

AIM
To overcome this methodologic problem, participants in the current study were asked whether they have avoided alcohol in the past 6 mo, and if they had, how severe their alcohol intolerance would be if they were to drink alcohol.

METHODS
The instrument used was a validated scale called the DePaul symptom questionnaire. Independent *t*-tests were performed among the alcohol intolerant or not alcohol intolerant group. The alcohol intolerant group had 208 participants, and the not alcohol intolerant group had 96 participants.

RESULTS
Using specially designed questions to properly identify those with alcohol intolerance, those who experienced alcohol intolerance *vs* those who did not experience alcohol intolerance experienced more frequent/severe symptoms and domains. In addition, using a multiple regression analysis, the orthostatic intolerance symptom domain was related to alcohol intolerance.

CONCLUSION
The findings from the current study indicated that those with ME/CFS are more likely to experience alcohol intolerance. In addition, those with this symptom have more overall symptoms than those without alcohol intolerance.

Core Tip: The findings from the current study indicated that those with myalgic encephalomyelitis/chronic fatigue syndrome are more likely to experience alcohol intolerance.

INTRODUCTION

Myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS) is a chronic illness characterized by persistent debilitating fatigue, post-exertional malaise, cognitive impairment, and sleep dysfunction[1]. In addition to these core symptoms, individuals with ME/CFS may also present with a variety of other symptoms. Symptom occurrence patterns have been previously proposed as a method of determining ME/CFS subtypes[2,3].

In response to anecdotal observation of alcohol avoidance in individuals with ME/CFS, several studies have attempted to quantify alcohol intake. The majority of these studies reported decreased alcohol intake in ME/CFS, but results are inconsistent across studies. Woolley *et al*[4] reported that 66% of respondents chose to reduce alcohol intake, with the most common justifications being "increased tiredness after drinking (67%), increased nausea (33%), exacerbated hangovers (23%) and sleep disturbance (24%)." The same study also reported increased impairment in the ability to work, engage in social or leisurely activities, and memory function in those with reduced alcohol intake[4]. Weigel *et al*[5] and van't Leven *et al*[6] also reported reduced alcohol intake in ME/CFS compared to the general population and non-fatigued controls, respectively. In contrast, Hamaguchi *et al*[7] reported no significant difference in alcohol intake in participants with ME/CFS.

Studies focusing on alcohol intolerance or sensitivity as a potential symptom of ME/CFS have produced similarly inconsistent findings. Jason *et al*[8] found a statistically significant higher prevalence of alcohol intolerance in participants with ME/CFS compared to non-fatigued controls. Within ME/CFS populations, De Becker *et al*[9] found that 59%-64% of participants who met either the Holmes or Fukuda diagnostic criteria for ME/CFS reported alcohol intolerance. Chu *et al*[10] found that 66% of participants with ME/CFS reported an increased sensitivity to alcohol after becoming ill. However, Nisenbaum *et al*[11] found no significant difference in alcohol intolerance between fatigued and non-fatigued respondents.

Surveys that ask respondents with ME/CFS whether they experienced alcohol intolerance within a recent time frame might produce inaccurate results since respondents may indicate that the symptom was not present if they have avoided alcohol in the designated time frame[12]. Due to this concern, in research there is a need to ask participants whether they have avoided alcohol in the past 6 mo, and if they have, how severe their alcohol intolerance would be if they were to drink alcohol. The failure to account for the effect of question wording may partially explain the inconsistency in findings related to alcohol intolerance in ME/CFS.

Despite inconsistent findings in the literature, alcohol intolerance has been identified as a clinically relevant feature of ME/CFS by Bansal[13], even suggesting that the ability to tolerate four or more drinks in one sitting should prompt healthcare practitioners to rethink an ME/CFS diagnosis. Chu *et al* [10] previously speculated that alcohol intolerance in ME/CFS might be related to underlying autonomic dysfunction, which would also explain the high prevalence of orthostatic intolerance and impaired temperature regulation in ME/CFS. Baraniuk[14] speculated that alcohol intolerance in ME/CFS may be related to the effect of acetate (a byproduct of ethanol breakdown) on mitochondrial function, which is already known to be impaired in ME/CFS[15,16]. The added stress of high acetate levels during alcohol consumption may cause more severe dysfunction in areas of the brain that are highly metabolically active[14]. However, to our knowledge, neither hypothesis has been directly investigated.

The present study aimed to provide insight into the role of alcohol intolerance in ME/CFS by identifying correlations between alcohol intolerance and other common symptoms. We hypothesized that alcohol intolerance correlates with measures of autonomic dysfunction (such as orthostatic and temperature intolerance), measures of neurocognitive dysfunction, and higher severity of physical

impairment. Further, we investigated whether alcohol intolerance may be used to distinguish a clinically relevant subtype of ME/CFS.

MATERIALS AND METHODS

Participants

The present study utilized a previously collected cross-sectional sample of adults with various chronic illnesses from a larger study[17]. Participant recruitment was conducted *via* email requests to national foundations as well as posts to social media outlets, research forums, and support group websites. Participants were directed to complete an online questionnaire after establishing informed consent. Approval was provided by the DePaul University Institutional Review Board for all study methods.

For the purposes of this investigation, participants were included if they reported a diagnosis of CFS, ME, or ME/CFS, and if they responded to the DePaul symptom questionnaire-2 (DSQ-2) questions used to classify alcohol intolerance (*n* = 304). Exclusion criteria consisted of a diagnosis of cancer, lupus, multiple sclerosis, post-polio syndrome, HIV/AIDS, or Gulf War syndrome.

Measures

Participants completed the DSQ-2[12], a self-report questionnaire that assesses ME/CFS symptomatology as well as social, occupational, and medical history, and demographic information. The DSQ-2 constitutes an addition of 34 items to the DePaul Symptom Questionnaire-1 (DSQ-1), which has previously shown favorable results for construct, convergent, and discriminant validity[18] and test-retest reliability[19]. The DSQ-2 is publicly available in the shared library of the Research Electronic Data Capture (REDCap)[20,21] and can be accessed at https://redcap.is.depaul.edu/surveys/ ?s=4NJ9CKW7JD.

Participants were asked to rate the frequency and severity of each symptom over the past 6 mo on 5-point Likert scales. For frequency, participants chose between the following options: 0 = none of the time; 1 = a little of the time; 2 = about half the time; 3 = most of the time; and 4 = all of the time. For severity, participants chose between the following options: 0 = symptom not present; 1 = mild; 2 = moderate; 3 = severe; and 4 = very severe. Composite scores were generated for each symptom by averaging respective scores for frequency and severity and multiplying by 25 for a 100-point scale. Higher scores indicate a higher burden of the designated symptom. Symptom domain scores were calculated by averaging the composite scores for each item within the following symptom domains, previously determined by exploratory factor analysis on DSQ-2 data, including post-exertional malaise, cognitive impairment, fever and flu, pain, sleep disruption, orthostatic intolerance, genitourinary, and temperature intolerance[12].

Table 1 lists the DSQ-2 questions used to classify alcohol intolerance. The DSQ-2 question relating to frequency of alcohol intolerance over the past 6 mo was omitted due to ambiguity as to whether responses reflected the frequency of drinking alcohol or the frequency of experiencing alcohol intolerance when drinking alcohol.

Participants were classified as alcohol intolerant if they met either condition: (1) Reported a severity of moderate or higher on alcohol intolerance within the past 6 mo (options 2-4 on question 1 in Table 1); or (2) Reported that they were avoiding alcohol ("Yes" on question 2), and their alcohol intolerance would be moderate or higher if they were to drink alcohol (options 2-4 on question 3 in Table 1).

Participants were classified as "not alcohol intolerant" if they met either condition: (1) Reported alcohol intolerance severity within the past 6 mo as "symptom not present" or "mild" (options 0-1 on question 1 in Table 1); or (2) Reported that they were avoiding alcohol ("Yes" or "No, I do not drink alcohol for other reasons" on question 2), and their alcohol intolerance would be mild or not present if they were to drink alcohol (options 0-1 on question 3).

For the linear regression, alcohol intolerance was coded as a linear variable based on the following conditions: (1) If the participant answered that they were avoiding alcohol ("Yes" on question 2), alcohol intolerance was coded as the score of how severe alcohol intolerance would be if they were to drink alcohol (question 3); and (2) If the participant was NOT avoiding alcohol, alcohol intolerance was coded as the score of alcohol intolerance severity in the past 6 mo (question 1).

In addition to the DSQ-2, participants were also asked to complete the MOS 36-item Short-Form Health Survey (SF-36)[22]. The SF-36 is a self-report measure that assesses health across eight general domains: Physical functioning; role limitations due to physical health problems (role physical); bodily pain; general health functioning; vitality; role limitations due to personal or emotional problems (role emotional); and mental health. Responses to each of the 36 items are recoded to a 100-point scale, and items are grouped together based on the eight domains. Subscale scores are then generated by averaging item scores within each domain, with higher scores indicating better functioning in the domain. Adequate psychometric properties have been demonstrated for SF-36 across diverse patient groups[23], and it has previously been shown to perform well in measuring fatigue-related functional impairment in ME/CFS[24].

Table 1 DePaul symptom questionnaire-2 questions used to classify alcohol intolerance

Question	Response options
Severity: Throughout the past 6 months, how much has alcohol intolerance bothered you?	0 = symptom not present
	1 = mild
	2 = moderate
	3 = severe
	4 = very severe
Over the last 6 months, did you avoid alcohol due to an alcohol intolerance (feeling sick after drinking alcohol)?	Yes
	No, I drank alcohol
	No, I do not drink alcohol for other reasons
If you were to drink alcohol, how severe would the intolerance be?	0 = symptom not present
	1 = mild
	2 = moderate
	3 = severe
	4 = very severe

Statistical analyses

Independent *t*-tests were performed using SPSS 26 for all DSQ-2 symptoms and SF-36 items. Participants were divided into a binary classification of "alcohol intolerant" or "not alcohol intolerant." Due to the large number of items that were tested, we only considered findings significant if $P \leq 0.01$, and we used two-tailed significance levels.

Multiple linear regression was conducted to determine if composite symptom scores in the eight DSQ-2 domains were predictors of alcohol intolerance severity scores. Age and sex (coded in the data set as: 1 = male; 2 = female; and 3 = other) were also evaluated in the regression model.

RESULTS

Demographics

Table 2 describes the demographic characteristics of the sample separated by the binary alcohol intolerance classification. The alcohol intolerant group (n = 208) had a mean age of 45.48 (standard deviation = 16.49), and the not alcohol intolerant group (n = 96) had a mean age of 45.54 (standard deviation = 17.40). Both groups were predominantly female and Caucasian/White. The majority of the sample reported being on disability (50.0% for the alcohol intolerant group; 40.6% for the not alcohol intolerant group) and married/living with a partner (45.2% for the alcohol intolerant group; 55.2% for the not alcohol intolerant group).

t-tests were conducted on mean composite scores for 79 individual symptoms, mean composite scores for the 8 symptom domains (calculated by averaging composite scores for items within the symptom domain), and subscale scores for 8 SF-36 domains. Results of the independent *t*-tests for DSQ-2 symptoms are available in Table 3. Out of 79 individual symptoms, 33 (41%) were significantly different ($P \leq 0.01$). For every statistically significant symptom, mean composite scores were higher for the alcohol intolerant group, indicating a higher symptom burden (in terms of frequency and severity of the symptom).

Of the eight symptom domains, five domain scores were significantly higher for the alcohol intolerant group, including post-exertional malaise, cognitive impairment, pain, orthostatic intolerance, and temperature intolerance. The fever and flu, sleep disruption, and genitourinary domains were not significantly different between the two groups.

Results of the *t*-tests for the SF-36 are presented in Table 4. The alcohol intolerant group scored significantly lower on physical functioning and bodily pain. Higher scores indicate better functioning on the SF-36, so lower scores for the alcohol intolerant group would indicate worse functioning.

Results of the multiple linear regression are available in Table 5. The overall multiple linear regression was statistically significant [R^2 = 0.14, F (10, 233) = 3.64, $P \leq 0.001$]. Sex, age, and seven out of eight symptom domains did not significantly predict alcohol intolerance severity ($P \leq 0.05$). Only the orthostatic intolerance domain significantly predicted alcohol intolerance severity (β = 0.21, P = 0.01). We did not use the SF-36 domains as predictors as our interest was in assessing which symptoms might

Table 2 Demographic characteristics of the sample (*n* = 304) separated by binary alcohol intolerance classification

Characteristic	Alcohol intolerant, *n* = 208		Not alcohol intolerant, *n* = 96	
	mean (%)	SD or *n*	mean (%)	SD or *n*
Age	48.07	12.26	49.57	13.50
Sex				
Male	11.1	23	8.3	8
Female	87.5	182	88.5	85
Race				
White	95.2	198	99.0	95
Asian or Pacific Islander	1.4	3	1.0	1
Other	2.9	6	0	0
Latinx				
No	98.1	204	96.9	93
Yes	1.4	3	3.1	3
Education				
High school diploma or less	12.0	25	9.4	9
College degree or partial college	46.2	96	55.3	53
Graduate degree	41.3	86	34.4	33
Work status				
On disability	50.0	104	40.6	39
Working (full-time or part-time)	25.5	53	29.2	28
Retired	8.7	18	13.5	13
Unemployed	16.3	34	11.5	11
Student or homemaker	9.6	20	12.6	12
Marital status				
Married or living with partner	45.2	94	55.2	53
Never married	31.7	66	25.0	24
Divorced	16.8	35	14.6	14
Widowed	1.9	4	3.1	3
Separated	2.9	6	2.1	2

be related to alcohol intolerance rather than physical or mental functioning.

DISCUSSION

Prior research assessed alcohol intolerance, but respondents could indicate that the symptom was not present if they have avoided alcohol in the designated time frame. When participants were asked whether they have avoided alcohol in the past 6 mo, and if they had how severe their alcohol intolerance would be if they were to drink alcohol, those designated in the alcohol intolerant group evidenced a higher symptom burden (in terms of frequency and severity of the symptoms). A second unique finding was that the orthostatic intolerance symptom domain predicted alcohol intolerance.

The fact that orthostatic intolerance was the only variable related to alcohol intolerance is of theoretical importance. Others have suggested that alcohol intolerance might be related to underlying autonomic dysfunction, which might help explain the high levels of orthostatic intolerance and impaired temperature regulation in ME/CFS[10]. It is also possible that the added stress of high acetate levels, which are a byproduct of ethanol breakdown, may cause more severe dysfunction in areas of the brain that are highly metabolically active[14].

Table 3 Differences in composite DePaul symptom questionnaire-2 symptom scores

Symptom	Alcohol intolerant	Not alcohol intolerant	P value
	mean (SD)	mean (SD)	
Post-exertional malaise	79.53 (15.46)	71.99 (17.07)	< 0.01
Feeling drained	74.70 (21.53)	67.06 (23.31)	0.01
Minimum exercise	78.99 (20.48)	72.27 (20.62)	0.01
Worse after physical activity	80.83 (21.42)	74.22 (21.83)	0.01
Soreness	77.84 (19.87)	70.96 (20.40)	0.01
Fatigue	81.86 (15.10)	77.47 (15.88)	0.02
Heavy feeling	83.87 (22.56)	69.53 (30.82)	< 0.01
Muscle fatigue	76.80 (24.01)	64.32 (26.03)	< 0.01
Unrefreshing sleep	81.52 (18.83)	80.08 (20.80)	0.57
Cognitive impairment	61.53 (18.28)	54.92 (18.39)	< 0.01
Difficulty remembering	68.84 (22.51)	64.58 (25.17)	0.14
Difficulty finding right word	61.78 (23.69)	54.56 (23.02)	0.01
Difficulty understanding	51.02 (24.93)	44.14 (24.33)	0.02
Absent-mindedness	62.74 (24.94)	57.50 (22.73)	0.08
Slowness of thought	60.34 (24.78)	52.99 (25.70)	0.02
Only focus on one thing	68.96 (23.14)	59.38 (24.60)	< 0.01
Difficulty paying attention	72.84 (23.31)	66.97 (23.77)	0.04
Slowed speech	35.75 (27.80)	29.61 (24.33)	0.07
Mental tiredness	71.32 (21.74)	64.19 (23.55)	0.01
Fever and flu	37.71 (19.81)	33.74 (19.55)	0.1
Fever	16.36 (21.41)	14.71 (20.52)	0.53
High temperature	33.82 (26.14)	29.43 (26.09)	0.18
Flu-like symptoms	52.84 (25.87)	49.22 (27.97)	0.27
Prolonged viral illness recovery	38.16 (32.95)	35.68 (33.88)	0.55
Fluctuations in temperature	47.18 (31.83)	39.76 (31.38)	0.06
Pain	54.84 (22.94)	46.30 (21.86)	< 0.01
Stomach pain	45.11 (28.08)	36.33 (25.14)	0.01
Irritable bowel	51.98 (31.39)	44.01 (31.88)	0.04
Bloating	50.79 (28.83)	41.45 (25.80)	0.01
Muscle pain	71.45 (25.12)	63.15 (29.43)	0.02
Sleep disruption	57.63 (23.80)	51.52 (25.12)	0.04
Problems staying asleep	61.29 (28.62)	54.04 (29.16)	0.04
Waking up early	52.40 (28.64)	44.53 (30.07)	0.03
Problems falling asleep	61.29 (28.62)	54.04 (29.16)	0.39
Orthostatic intolerance	39.99 (23.21)	27.86 (22.93)	< 0.01
Graying or blacking out after standing	28.14 (29.39)	17.63 (24.90)	< 0.01
Blurred or tunnel vision after standing	35.52 (31.01)	25.13 (28.51)	0.01
Heart beats quickly after standing	50.12 (31.11)	35.66 (33.37)	< 0.01
Dizziness	45.91 (26.21)	33.85 (26.34)	< 0.01
Genitourinary	43.06 (26.18)	36.81 (23.43)	0.05

Urinary urgency	41.95 (30.88)	38.03 (31.99)	0.31
Bladder problems	36.96 (31.91)	29.82 (27.29)	0.05
Nighttime urinary urgency	50.18 (31.51)	42.37 (30.20)	0.04
Temperature intolerance	39.45 (22.76)	28.60 (19.98)	< 0.01
Chills or shivers	37.38 (26.16)	27.34 (24.01)	< 0.01
Low temperature	29.41 (28.02)	17.45 (20.80)	< 0.01
Cold limbs	51.02 (28.65)	41.02 (28.89)	0.01
Other			
Needing to nap daily	58.74 (28.63)	53.39 (30.80)	0.14
Sleep inversion	21.80 (30.09)	16.28 (26.85)	0.11
Joint pain	60.33 (31.88)	56.64 (30.99)	0.35
Eye pain	34.24 (29.25)	25.52 (25.32)	0.01
Chest pain	28.32 (23.57)	19.79 (24.24)	< 0.01
Headaches	53.32 (26.10)	45.18 (24.69)	0.01
Twitching	38.28 (26.15)	30.34 (24.25)	0.01
Muscle weakness	68.15 (25.56)	57.81 (25.92)	< 0.01
Sensitivity to noise	64.12 (25.50)	57.55 (27.95)	0.04
Sensitivity to light	58.53 (28.25)	51.04 (29.00)	0.03
Unable to focus vision	41.35 (26.21)	33.06 (22.82)	0.01
Unable to focus attention	56.63 (21.10)	53.89 (20.75)	0.31
Loss of depth perception	31.10 (31.76)	17.63 (24.22)	< 0.01
Nausea	39.42 (24.74)	26.04 (25.76)	< 0.01
Feeling unsteady	49.70 (28.00)	36.85 (25.48)	< 0.01
Shortness of breath	38.88 (27.26)	35.81 (26.07)	0.36
Irregular heartbeat	32.91 (26.82)	28.26 (26.79)	0.16
Losing weight	19.04 (25.04)	17.34 (19.65)	0.6
Gaining weight	52.70 (33.53)	47.58 (31.51)	0.3
Loss of appetite	30.37 (24.52)	31.12 (25.84)	0.81
Sweating hands	15.99 (23.28)	15.89 (24.97)	0.97
Night sweats	37.44 (29.32)	35.55 (30.20)	0.61
Feeling hot or cold	53.93 (26.88)	45.96 (26.93)	0.02
Sore throats	37.50 (25.00)	32.16 (24.11)	0.08
Lymph nodes	39.54 (28.82)	34.08 (27.50)	0.12
Sensitivity to smells	53.43 (30.68)	37.50 (30.99)	< 0.01
Sensitivity to mold	29.89 (37.74)	21.45 (29.94)	0.04
Temperature intolerance	72.52 (26.97)	55.60 (31.93)	< 0.01
Worse after mental activity	66.41 (24.31)	59.87 (28.53)	0.06
Feeling disoriented	40.44 (25.23)	33.68 (23.36)	0.03
Difficulty reading	50.96 (32.42)	39.34 (30.89)	< 0.01
Eye aching	40.44 (29.61)	30.66 (28.47)	0.01
Sensitivity to pain	53.50 (31.78)	44.35 (36.19)	0.04
Pain from pressure	27.00 (34.21)	24.87 (33.73)	0.62
Daytime drowsiness	64.24 (26.74)	60.53 (27.85)	0.27

Sensitivity to vibrations	36.34 (35.50)	21.68 (31.39)	< 0.01
Poor coordination	51.68 (28.56)	38.42 (25.08)	< 0.01
Sinus infections	25.00 (28.84)	23.68 (25.36)	0.69
Upright position intolerance	51.98 (32.87)	44.08 (32.86)	0.05

Table 4 Differences for short form-36 domain scores

Domain	Alcohol intolerant	Not alcohol intolerant	P value
	mean (SD)	mean (SD)	
Physical functioning	23.91 (20.45)	34.27 (21.86)	< 0.01
Role physical	2.00 (9.39)	4.39 (11.22)	0.12
Bodily pain	34.30 (22.50)	43.82 (26.36)	< 0.01
General health	23.28 (15.02)	25.51 (14.36)	0.29
Vitality	8.98 (10.74)	12.47 (13.75)	0.06
Social functioning	18.34 (20.03)	25.51 (22.38)	0.02
Role emotional	69.54 (42.15)	63.01 (43.94)	0.29
Mental health	67.08 (18.84)	66.48 (20.00)	0.83

Table 5 Linear regression for symptom domain scores, sex, and age

Feature	Unstandardized coefficients		Standardized coefficients	t	P	95%CI	
	B	SE	Beta			LL	UL
Constant	0.90	0.70	< 0.01	1.29	0.20	-0.47	2.27
Sex	-0.27	0.27	-0.06	-1.01	0.31	-0.79	0.25
Age	< 0.01	0.01	0.04	0.57	0.57	-0.01	0.02
PEM domain	0.01	0.01	0.15	1.82	0.07	0.00	0.02
Cognitive impairment domain	< 0.01	0.01	-0.04	-0.54	0.59	-0.01	0.01
Fever/flu-like symptoms domain	-0.01	0.01	-0.11	-1.39	0.16	-0.02	0.00
Pain domain	< 0.01	< 0.01	0.07	0.89	0.37	0.00	0.01
Sleep disruption domain	< 0.01	< 0.01	-0.03	-0.43	0.67	-0.01	0.01
Orthostatic intolerance domain	0.01	< 0.01	0.21	2.57	0.01	0.00	0.02
Genitourinary domain	0.01	< 0.01	0.12	1.73	0.08	0.00	0.01
Temperature intolerance domain	0.01	< 0.01	0.09	1.11	0.27	0.00	0.01

CI: Confidence interval; LL: Lower limit of the confidence interval; PEM: Post-exertional malaise; UL: Upper limit of the confidence interval.

A strength of the current study was using a validated questionnaire, the DePaul Symptom Questionnaire, that differentiates the frequency and severity of symptoms as well as specifies threshold values for determining whether symptoms meet a necessary threshold of being a burden for the patient. When symptoms are measured only using occurrence as a binary outcome, patients who experience the symptom at relatively low frequencies and/or severities are counted, even if the symptom might not represent any burden to the respondent. It is only by using more differentiated surveys that allow these important characteristics to be assessed and using questionnaires that have been validated that more assurance can occur that symptoms such as alcohol intolerance are being accurately identified in patients.

There are several limitations in this study. First, all analyses relied on self-report data. Thus, there was no biological confirmation of alcohol intolerances in the respondents. In addition, the designation of ME/CFS was also based on self-report. Therefore, there was not an independent assessment of this illness by a medical health care professional. Finally, the sample was somewhat biased toward women

who were White, and the outcomes of a more sociodemographic sample is unclear.

CONCLUSION

In general, the findings from the current study indicated that those with ME/CFS are more likely to experience alcohol intolerance. It is very likely that this subtype of patients might have other biologic differences, and future research is needed to explore this hypothesis. The contribution of the current study was assessing the construct of alcohol intolerance in a more sophisticated way than has been attempted in previous investigations.

ARTICLE HIGHLIGHTS

Research background

There is a need to objectively measure alcohol intolerance among those with myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS).

Research motivation

There is a need to determine if those with ME/CFS with alcohol intolerance are more symptomatic than those without alcohol intolerance.

Research objectives

We aimed to carefully measure alcohol intolerance and determine its effects on those with ME/CFS.

Research methods

We collected data from patients with ME/CFS using a validated symptom questionnaire.

Research results

We were able to determine that those with alcohol intolerance were more symptomatic than those without it among a sample of patients with ME/CFS.

Research conclusions

It is important to measure alcohol intolerance carefully among patients who are not going to report using alcohol over the preceding months.

Research perspectives

It is possible to reliably and validly measure alcohol intolerance among those with ME/CFS, and this should guide future research in this area.

FOOTNOTES

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