Alcohol 81 (2019) 39–46

Contents lists available at ScienceDirect

Alcohol

journal homepage: http://www.alcoholjournal.org/

Psychometric properties of the Alcohol Use Disorder Identification Test (AUDIT) in adolescents and young adults from Southern Mexico

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ARTICLE INFO

Article history:
Received 8 May 2018
Received in revised form
7 May 2019
Accepted 7 May 2019

Keywords:
Alcohol-related disorders
Young people
AUDIT
Harmful consumption
Symptoms of dependence

ABSTRACT

Introduction: Alcohol abuse is a worldwide health problem because of its association with high rates of morbidity, mortality, and interpersonal conflicts. In Mexico, young people are the group most severely affected by high levels of alcohol intake. This study attempts to evaluate the psychometric characteristics of the Alcohol Use Disorders Identification Test (AUDIT) in the Mexican youth population, since validation studies do not currently exist.

Materials and methods: An opinion sampling method was used based on the inclusion criteria for the study and the accessibility of the sample. Participants' ages ranged from 14 to 30, and 44.2% (N = 854) were male and 55.8% (N = 1078) were female.

Results: The psychometric guarantees of AUDIT have been confirmed, highlighting the value of Alpha Cronbach (.804) of the scale, and the validity of its internal structure through a confirmatory factor analysis, which showed the validity of the model of the three factors (Risky use, Dependence symptoms, and Harmful alcohol use). The results confirm a pattern of non-daily use, and concentrated, excess use on a single occasion. The existence of significant differences has also been confirmed in terms of the legal drinking age in some of the indicators used, and the risk of alcohol consumption increases with age.

Conclusions: The appropriate psychometric properties of AUDIT have been confirmed in the Mexican youth population. It shows a public health issue that requires the design of prevention programs that impact risk factors and promote protective factors.

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Introduction

Alcohol abuse represents a major social and medical issue, as evidenced by international, Latin-American, and European institutions (European Monitoring Centre for Drugs and Drug Addiction, 2015; Pan American Health Organization, 2015; World Health Organization, 2014). Apart from the numerous risks to physical health in adolescents and youngsters, there are other psychosocial risks arising from reckless, aggressive, or self-injurious behavior, which have an impact on family interactions and the relationships with peers at multiple levels (Guillén, Roth, Alfaro, & Fernández, 2015; Soloski, Monk, & Durtschi, 2016).

The United Nations Office on Drugs and Crime's *World Drug Report 2015* (United Nations Office on Drugs and Crime, 2016) establishes that the impact of illicit drug use on health remains an issue of concern. It also demonstrates that alcohol remains the drug of choice for psychoactive substance abuse initiation. As outlined by Villar, Pinto, Barizon, and Ferreira (2016), alcoholism-related complications are estimated to represent between 2% and 9% of primary care consultations globally. Meanwhile, alcohol abuse is associated with high morbidity and mortality rates, and it tends to cause damage in the psychosocial domain (Moral & Ovejero, 2011; Morales et al., 2015), as well as causing interpersonal conflicts, high-risk sexual behavior, aggressive behavior, injuries of several types, and violative behavior, among others (Giménez, Motos, &

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https://doi.org/10.1016/j.alcohol.2019.05.002
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Cortés, 2014; Isorna, Fariña, Sierra, & Vallejo, 2015; Kneller & Harvey, 2016).

According to the World Health Organization's data (2014), one in five drinkers (22%) in Latin America and the Caribbean is involved in heavy alcohol drinking episodes. This number is higher than the average global percentage, estimated at 16%. In the case of adolescents, alcohol use represents a high-risk behavior, with a wide range of prevalence ranges in South American secondary students (from less than 20% to nearly 70%). In Mexico, epidemiologic studies have demonstrated a significant increase in alcohol use among the young population, with alcohol being the most commonly reported initiation drug among individuals seeking treatment or rehabilitation. Indeed, 12- to 24-year-olds represent 63% of the alcohol drinking population. According to Mexican Annual Surveys on Addiction (ASA) from 2003, 2009, and 2011 (Medina-Mora et al., 2012), alcohol use prevalence significantly increased between 2002 and 2011 nationwide. In addition, 6% of alcohol drinkers develop dependency, the proportion being three males to one female among youngsters.

Regarding the consumption pattern among youngsters, the most frequent behavior in Mexico is drinking high amounts of alcohol on a single occasion, according to the *binge drinking* Anglo-Saxon modality (5 or more drinks in a short period of time). Indeed, *Intense Alcohol Consumption* (IAC) corresponds to an intake of at least 60 g in men, and at least 40 g in women, within a 2- to 3-h lapse. This pattern increases risks for young drinkers' physical and mental health, assuming the Standard Drinking Unit (SDU) is between 8 and 13 g of pure alcohol; in Mexico it is 13 g, according to the National Commission against Addictions (Ministry of Health [SSA] and National Commission against Addictions [CONADIC], 2012). According to a 2014 National Survey on Drug Consumption in Students, one and a half million secondary and high-school students have ever been involved in alcohol abuse – more than five drinks on a single occasion – this consumption pattern being the most common one in the university population (Betanzos-Díaz, Colli-Magaña, & Paz-Rodríguez, 2012; Luque, Gómez, Cortés, Espejo, & Giménez, 2014; Motos, Cortés, Giménez, & Cadaveira, 2015; Parada et al., 2011; Tamez-Rodríguez et al., 2013; Telumbre & Sánchez, 2015). Furthermore, the National Council against Addictions reports a high prevalence of alcohol use – 50%–80% of people under 20 have ever drunk alcohol. In this respect, according to the National Survey on Addictions (Medina-Mora et al., 2012), 42.9% of 12- to 17-year-old adolescents stated they had ever drunk alcohol. It is worth noting that an early alcohol use onset age represents a risk factor for intensive alcohol consumption (Guitart et al., 2011; Motos et al., 2015; Rossow & Kuntsche, 2013; Villatoro, Gutierrez et al., 2009; Villatoro, Medina-Mora et al., 2016).

The Alcohol Use Disorders Identification Test (AUDIT) in Mexican university students found a hazardous and harmful alcohol consumption prevalence of 18% in the total sample (11.3% in women and 27.4% in men) during the last year. Regarding abuse/dependency, the Health Department states that 27% of adolescents aged 12–19 drink alcohol, according to a non-daily consumption pattern (less than 1% present with daily abuse), but a concentrated and heavy pattern. Harmful consumption is estimated to be present in 25% of children and youngsters (Morales et al., 2015). The use of AUDIT is frequent in numerous studies on alcohol use in Mexican university students, in places such as Guadalajara (Santes-González, Enríquez-Rodríguez, & Elías-López, 2013), Guerrero (Telumbre & Sánchez, 2015), Nuevo León (Armendáriz, Villar, Alonso, Alonso, & Oliva, 2012), and Veracruz (Puig-Nolasco, Cortaza-Ramírez, & Pillon, 2011). However, there are no studies about the psychometric properties for the young population.

As a result of all this, further research on alcohol abuse among the young population proves necessary, while taking into account that survey results show a higher alcohol use prevalence in South Mexico, in the state of Puebla. Therefore, our objective is to assess the psychometric characteristics of the *Alcohol Use Disorders Identification Test* (AUDIT) and study alcohol use (heavy, harmful, and dependent) among Mexican adolescents and youngsters.

Methods

Participants

Descriptive observational study of cases with cross-sectional analysis were carried out with students of Secondary Education, Baccalaureate and University of Social Sciences and Health, in the cities of Puebla (n = 860; 63.3% women), Tlaxcala (n = 517; 57.3% women), and Mérida (n = 555; 58.05% men) in Mexico. With regard to the educational level of the participants, 53.7% attend Baccalaureate (Preparatory) and Technical Secondary, of which 57.1% are women, and 46.3% (n = 894) are university students, being in this case, the highest percentage (50.6%) of males.

The ethical aspects were followed in accordance with the norms suggested by the Sociedad Mexicana de Psicología, 2007 and the declaration of Helsinki. For this study, we have counted on the collaboration, with informed consent, of 1932 adolescents and young people who have been selected by survey sampling based on the fulfillment of a series of inclusion criteria (schooling at the selected centers, voluntariness of participation and diligence, correctly completing the survey) and accessibility to the sample. The age range is 14–30 years (X = 18.16, SD = 2.57) for both sexes, being 44.2% males (N = 854) and 55.8% females (N = 1078).

Research variables and evaluation instruments

The Alcohol Use Disorders Identification Test (AUDIT) has been used to identify risky and harmful consumption, as well as to identify alcohol dependence (Saunders, Aasland, Babor, de la Fuente, & Grant, 1993). The AUDIT is an instrument with cross-cultural validity that has been validated in the Mexican population and in adolescent populations (Facundo, Pedrão, Aguilar, Garcia, & Almanza, 2007; Flores, Rodríguez, & Guzmán, 2006). It is a screening test integrated by ten items, of which the first three analyze the amount and frequency of consumption, and the remaining explore potential disorders caused by harmful consumption. This questionnaire has a minimum value of 0 and a maximum of 40 points, with a cut-off point of 8, a score that identifies problems with the way of drinking. Regarding the range, a score ranging from 0 to 3 alludes to sensible consumption, from 4 to 7 points presents a dependent consumption, and from 8 to 40 points indicates harmful consumption. In the Spanish validation (Rubio, Bermejo, Caballero, & Santo-Domingo, 1998), the cut-off point for the detection of risk consumption in men was 9 or more, and in women it was 6 or more. Given this characterization of risk for dependence and harmful consumption of alcohol, it is consistent with the pattern described in the ICD-10 and has demonstrated its effectiveness in discriminating adolescents at risk of alcohol consumption.

Procedure and data analysis

We have opted for a non-experimental correlational research design, carried out on an intrasubject design, with selection of the participants through a probabilistic sampling. The adolescents and young people who participated in the study signed an informed consent and were advised of the confidentiality and anonymity of

the answers. Scales were applied in the class hour unit, by trained professionals and research assistants.

Various statistical techniques have been used to establish the reliability and internal consistency of the AUDIT scale, including exploratory and confirmatory factor analyses through the model of structural equations and reliability analysis. For the confirmatory factorial analysis, we have taken into account the CFI and RMSEA statistics. A correlational analysis has also been carried out among the different AUDIT factor items in order to verify the existing relationship. A contrast of means has been made, using the Student's *t* test for independent samples, in order to determine the existence of differences in the indicators explored based on the age of consumption. We also performed analysis of mean comparisons using the ANOVA procedure, using the sex variable as a criterion. The effect size (*d* of Cohen, 1969) has been calculated. For the processing and analysis of the data, the statistical package SPSS 21.0 was used.

Results

Given our research interest in assessing AUDIT psychometric characteristics in a sample of Mexican youngsters, construct validity and instrument reliability were assessed. Results demonstrate a high Cronbach's Alpha value (.804) for the whole test, with a total population of 1932 individuals. Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was also calculated, with a .866 value. Barlett's sphericity test was performed, proving statistically significant (.00), which confirmed that variables are interconnected, with a chi-squared value of 4926.219; $p < .001$. In particular, factorial structure factor values ranged between .809 for *Risk Alcohol Consumption* Factor 1, and .701 for *Harmful Alcohol Consumption* Factor 3 (see Table 1).

Internal structure validity was assessed using exploratory factor analysis, using the principal component analysis extraction method with orthogonal rotation, which found factor weights ranging between .844 and .688 (see Table 1). Meanwhile, confirmatory factor analysis demonstrates that the three-factor model of the AUDIT (*Alcohol Risk Consumption*, *Dependence Symptoms*, and *Harmful Alcohol Consumption*) for the whole sample is valid: CFI = .976; NFI = .970; RFI = .958; TLI = .967; IFI = .976; RMSEA = .043, with positive correlations among subfactors (see Fig. 1).

Specifically, the correlation between risky alcohol consumption (Factor 1) and Symptoms of dependence (Factor 2) is .20, between Symptoms of dependence and Harmful alcohol consumption (Factor 3) is .19, and between Risky alcohol consumption and Harmful consumption is .20. Likewise, Table 2 shows the bivariate correlations between the ten items of the AUDIT.

Regarding alcohol use prevalence rates, shown in Table 3, consumption frequency percentages demonstrate that 68.7% of sample individuals (n = 1321) drink alcohol, 4.0% drink alcohol two or three times a week, and 1.2% drink alcohol four or more times a week. Results confirm an intensive consumption pattern, with one day of normal consumption corresponding to one or two drinks for 68.7% of the sample, three or more drinks for 31.4%, and five or more drinks – intensive consumption – for a cumulated 16.8% of participants. In this respect, 38.6% of youngsters claim to drink six or more alcoholic drinks on a single occasion, with a consumption frequency of less than once a month for 27.0%, once a month for 9.1%, once a week for 2.3%, and once a day or almost once a day for a virtually negligible .2%. Thus, 73.3% of the adolescents and young participants presented at least one affirmative answer to one of the ten AUDIT questions valued up to four points each. In turn, 30.9% are in the range of up to 3 points, which is typical of risk consumption, 22.4% are in the range of up to 7 points, and 19.6% are in the range of 8–32 points (which represents the maximum score obtained in this study), which is indicative of harmful alcohol consumption.

As far as alcohol risk consumption is concerned, 30.1% of adolescent and young participants in the study are estimated not to present any risk, while 54.9% present a low risk, 14.7% present a moderate risk, and .9% present a high risk. Regarding dependency symptoms, they are absent in 71.4% of cases, with low risk for 22.3%, moderate risk for 5.8%, and high risk for .5%. Harmful alcohol consumption involves 38.8% of cases, of which risk is estimated as low in 32.4%, moderate in 5.9%, and high in .5%.

When assessing alcohol use disorders, differential analysis confirms the presence of significant differences according to consumption legal age level in indicators such as consumption frequency, typical amount drunk, high consumption frequency, and mental blackouts. In all cases, youngsters ages 18 and older have higher scores. Similarly, significant differences demonstrate a higher Alcohol Risk Consumption. Except for mental blackouts, where the effect size is negligible (ES = .13), in the rest of the cases, the effect size is small (consumption frequency = .36, typical amount = .43, and high consumption frequency = .30). The effect size for Alcohol Risk Consumption is small, with a .43 score (see Table 4).

With regard to the differences in risk behaviors of alcohol consumption according to gender, the existence of significant intergender differences in the three AUDIT factors, indicative of

Table 1
Analysis of reliability and factorial structure of AUDIT (N = 1932).

Factors	Items AUDIT	Content of the items	Cronbach's Alpha	Factorial Weight
Factor 1. Alcohol Risk Consumption	1	How frequently do you drink alcohol?	.809	.786
	2	How many alcoholic drinks do you have on a normal day?		.844
	3	How frequently do you have 6 or more alcoholic drinks on a single occasion?		.801
Factor 2. Symptoms of Dependence	4	How frequently over the last year were you unable to stop drinking once you had started?	.713	.706
	5	How frequently over the last year were you unable to do what people expected from you because you had been drinking?		.732
	6	How frequently over the last year did you need to drink on an empty stomach to recover after having drunk heavily on the previous day?		.724
Factor 3. Harmful consumption of alcohol	7	How often during the past year have you had remorse or feelings of guilt after drinking?	.701	.775
	8	How often during the past year have you been unable to remember what happened the night before because you had been drinking?		.688
	9	Have you or someone else been injured because you had drunk?		.759
	10	Has a family member, friend, doctor or health professional been concerned about drinking alcohol or suggested that you stop drinking?		.689

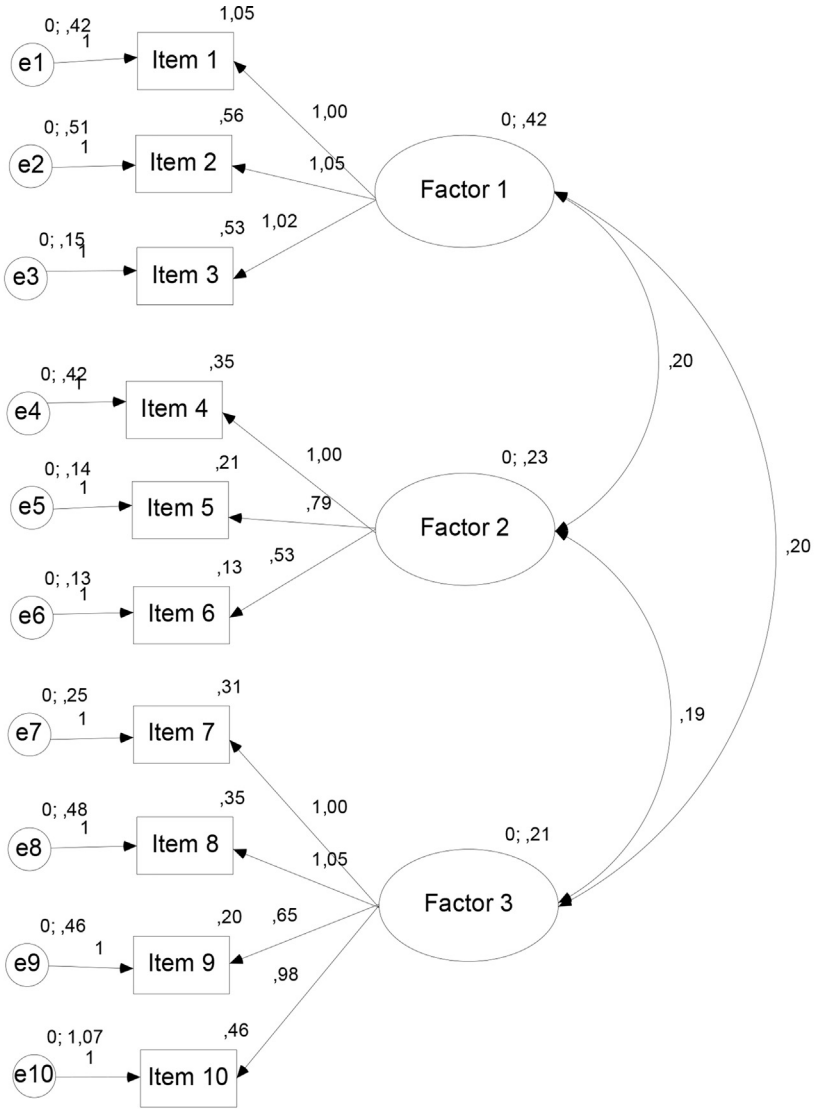


Fig. 1. Confirmatory factor analysis in the 10 items of the AUDIT and in the total sample (N = 1932). Factor 1: Alcohol Risk Consumption; Factor 2: Symptoms of Dependence; Factor 3: Harmful consumption of alcohol.

increased problematic alcohol consumption in the case of males, has also been observed (Factor 1: Alcohol Risk Consumption, $t = 2{,}398$, $p = .017$; Factor 2: Symptoms of Dependence, $t = 2.292$, $p = .022$; and Factor 3: Harmful consumption of alcohol, $t = 2.885$, $p = .004$), although the effect sizes are small (<.20). Likewise, the existence of significant differences according to gender in the total score of the AUDIT ($t = .3163$, $p = .002$), as well as in the cut-off points of 6 ($t = .2741$, $p = .006$) and 9 ($t = .3634$, $p = .000$), as stipulated in the validation to Spanish, is superior in all of them in the case of males, presenting 19.9% of their values greater than 9 as the cut-off point (13.6% in the case of women). On the other hand, there are differences in problematic alcohol use among boys and

Table 2
Bivariate correlations between the AUDIT items.

	AUDIT1	AUDIT2	AUDIT3	AUDIT4	AUDIT5	AUDIT6	AUDIT7	AUDIT8	AUDIT9	AUDIT 10
AUDIT1										
AUDIT2	.502**									
AUDIT3	.602**	.606**								
AUDIT4	.397**	.262**	.374**							
AUDIT5	.312**	.234**	.389**	.422**						
AUDIT6	.374**	.217**	.342**	.437**	.351**					
AUDIT7	.331**	.273**	.359**	.312**	.296**	.361**				
AUDIT8	.346**	.296**	.348**	.268**	.320**	.296**	.406**			
AUDIT9	.284**	.257**	.248**	.258**	.283**	.267**	.279**	.289**		
AUDIT10	.313**	.289**	.250**	.362**	.323**	.376**	.267**	.277**	.326**	

** $p < .05$.

Table 3
Prevalence of alcohol consumption (Risk consumption, Dependence, and Harmful consumption).

How often do you consume any alcoholic beverage?				**% (N)**
Never				31.6 (611)
One or fewer times a month				38.0 (735)
2 to 4 times a month				25.1 (484)
2 to 3 times a week				4.0 (78)
Four or more times a week				1.2 (24)
How many alcoholic drinks do you usually make on a day of normal consumption?				**% (N)**
One or two				68.7 (1327)
Three or four				16.6 (320)
Five or six				8.0 (154)
From seven to nine				4.2 (81)
Ten or more				2.6 (50)
How often do you drink 6 or more alcoholic drinks in a single occasion of consumption?				**% (N)**
Never				61.4 (1187)
Less than once a month				27.0 (521)
Monthly				9.1 (176)
Weekly				2.3 (45)
Daily or almost daily				.2 (3)
Factors of AUDIT/Risk	**Absent % (N)**	**Mild % (N)**	**Moderate % (N)**	**Elevated % (N)**
Consumption of alcohol risk	30.1 (581)	54.9 (1061)	14.17 (274)	.9 (174)
Symptoms of dependence	71.4 (1379)	22.3 (431)	5.8 (112)	.5 (97)
Harmful consumption of alcohol	61.2 (1182)	32.4 (626)	5.9 (114)	.5 (97)

Cut-off points for risk levels: Alcohol risk consumption (8–15 points); Symptoms of dependence (16–19 points); and alcohol consumption (scores equal to or greater than 20).

Table 4
Comparison of sample means in the AUDIT function of the legal age of alcohol consumption.

Items from AUDIT	Adolescents <18 years		Young people ≥18 years		*t*	*d* Cohen
	Mean	SD	Mean	SD		
AUDIT1 Consumption frequency	.87	.86	1.2	.92	−8.157*	.36
AUDIT2 Typical amount	.32	.77	.75	1.09	−9.932*	.43
AUDIT3 High consumption frequency	.40	.68	.63	.81	−6.746*	.30
AUDIT4 Loss of control over consumption	.35	.80	.35	.81	.005	0
AUDIT5 Consumption relevance increase	.22	.55	.20	.51	.882	.037
AUDIT6 Morning consumption	.15	.47	.11	.40	1.667	.093
AUDIT7 Sense of guilt after consumption	.31	.69	.32	.67	-.347	.014
AUDIT8 Mental blackouts	.29	.73	.40	.92	−2.991**	.13
AUDIT9 Alcohol-related injuries	.20	.72	.20	.75	-.143	0
AUDIT10 Others are concerned about consumption	.51	1.17	.42	1.09	1.820	.079
FACTOR1 Alcohol Risk Consumption	1.59	1.91	2.57	2.39	−10.046*	.43
FACTOR2 Symptoms of Dependence	.71	1.43	.66	1.34	.879	.036
FACTOR3 Harmful consumption of alcohol	1.30	2.24	1.34	2.28	-.334	.017

Level of significance of *t* for a sample * ≤ .001; ** ≤ .01; *** ≤ .05 n < 18 years = 872; n ≥ 18 years = 1.047.

girls under 18, specifically in symptoms of dependence and harmful behaviors. Males have higher risk consumption patterns. In contrast, there would be no gender differences based on the legal age of consumption, showing both major problems of risk, compared to younger ages (see Table 5).

Discussion

Alcohol represents an important public health issue that brings about significant consequences for alcohol consumers and their families, both globally and in Latin America. The objective of the study was to assess AUDIT psychometric characteristics in Mexican adolescents and youngsters (from Puebla, Tlaxcala, and Yucatán), as well as to identify heavy, harmful, and dependent alcohol use patterns in this population.

Regarding psychometric characteristics, AUDIT had a .804 Cronbach's Alpha for the whole sample. This value is similar to that found in studies with Mexican university student samples and with high school students from Mexico City. These data demonstrate good internal consistency, which recommends the use of AUDIT for

Table 5
Comparison of sample means in the AUDIT factors function of the legal age of alcohol consumption and by sex.

AUDIT Factors	Adolescents <18 years			t	d Cohen
	Male		Female		
	Mean (SD)		Mean (SD)		
FACTOR 1 Alcohol Risk Consumption	1.74 (2.11)		1.49 (1.76)	1.816	.13
FACTOR 2 Symptoms of Dependence	.93 (1.69)		.57 (1.21)	3.371*	.25
FACTOR 3 Harmful consumption of alcohol	1.67 (2.48)		1.06 (2.04)	3.783*	.27
AUDIT Factors	Adolescents ≥ 18 years			t	d Cohen
	Male	Female			
	Mean (SD)	Mean (SD)			
FACTOR 1 Alcohol Risk Consumption	2.63 (2.47)		2.52 (2.32)	.758	.046
FACTOR 2 Symptoms of Dependence	.65 (1.31)		.66 (1.36)	-.113	.007
FACTOR 3 Harmful consumption of alcohol	1.36 (2.33)		1.31 (2.23)	.392	.021

Level of significance of *t* for a sample * ≤.001; ** ≤.01; *** ≤.05 n < 18 years = 872; n ≥ 18 years = 1.047.

such populations, especially in adolescents and youngsters from Puebla, Tlaxcala, and Yucatán.

Our results maintain the three-factor original structure, with .688−.844 factor weights (Saunders et al., 1993). Other Mexican studies have proposed a two-factor model − identification of alcohol use disorders and frequency of alcohol with frequency and amount of alcohol use and alcohol use-related issues. The three-factor structure achieved in our research considers AUDIT as a useful tool to discriminate risk consumption, dependency symptoms, and harmful alcohol consumption in Mexican adolescents and youngsters. Indeed, AUDIT proves to be a valid and reliable tool for the identification of alcohol use disorders, as well as a useful tool for the assessment of prevention and intervention programs' efficacy, as it allows pre-and post-objective measurements to be carried out.

Additionally, the study results have made it possible to identify the magnitude of the alcohol use issue in adolescents and youngsters from the cities of Puebla, Tlaxcala, and Mérida (Yucatán), with 68.7% reporting they have ever had an alcoholic drink. This percentage is lower than that found in other studies carried out among university students from Guadalajara (Santes-González et al., 2013), Nuevo León (Armendáriz et al., 2012), and Veracruz (Puig-Nolasco et al., 2011). These results may be explained by the age range of study participants, since, apart from university students, our sample includes high school adolescents. In studies with younger samples (12−17 years old), percentages have been lower (Medina-Mora et al., 2012). Furthermore, the results from our study are consistent with the data of Villatoro, Medina-Mora et al. (2016), since it demonstrates that 68.8% of secondary, high school, and technical school students from Mexico City have ever drunk alcohol in their lives.

Regarding intensive alcohol consumption, the results from our study report that 31.4% of individuals in the sample had three or more drinks on a single occasion, 16.8% had five or more, and 38.6% had six or more. These results are higher than those reported by Villatoro, Medina Mora et al. (2016), where 14.5% of the individuals in the sample had five or more drinks on a single occasion. Again, these differences may stem from the age of the samples, since the surveyed population's mean age in the aforementioned study was lower than ours. In addition, in university students from Morelos, 25.9% reported to have had five or more drinks (Betanzos-Díaz et al., 2012), while in university students from Mexico City (Villatoro, Gutiérrez, et al., 2009), the proportion was 25.2%. It is worth noting that the proportion of individuals having had five or more drinks over the last month has increased in recent years, from 9.5% in 1991 to 14.5% in 2016, in the school-enrolled adolescent population. Our data reflect an older age range and a higher education level, since they include high school and university students, which may account for the differences observed.

Results confirm non-daily consumption pattern and a heavy one concentrated on a single occasion, which had already been proposed by the World Health Organization (2014) and by Morales et al. (2015). On the other hand, the study results demonstrate that frequency, typical amount, and consumption risk increase with age with modalities of binge drinking (Cortés, Giménez, Motos, Sancemi, & Cadaveira, 2017). This is consistent with previous studies and can be explained by the greater access to resources individuals have with growing age, and in particular, with the possibility of working and making more money, and of belonging to groups or attending events facilitating social consumption, as previously mentioned.

Similar to previous studies, the results demonstrate that most youngsters present alcohol use that may be considered as risk consumption. Such risk can be dependent and harmful, which makes prevention programs absolutely essential. Our results show that 55% of adolescents and youngsters present low risk consumption, while 14% present moderate risk consumption. As for dependency symptoms, 22% present low risk and 6% present moderate risk. In addition, regarding harmful consumption, 32% present low risk and 6% present moderate risk. These data are consistent with those from the Mexican Epidemiological Surveillance System on Addictions (Ministry of Health [SISVEA], 2013), which estimates that 6% of alcohol consumers develop alcohol use dependency. This seemingly low percentage represents an important group of youngsters with dependency and harmful consumption risks that require specialized attention to reduce consumption and therefore prevent consumption-related issues. Our research data corroborate that the incidence of this phenomenon in youngsters, which has already been demonstrated in previous studies (Puig-Nolasco et al., 2011; Santes-González et al., 2013), is an issue of concern. 1% of individuals in our sample presented high-risk consumption, while nearly 15% presented moderate risk consumption. These results are similar to those achieved by Villatoro, Medina Mora et al. (2016).

These percentages are lower than those found in the study by García, Novalhos, and Martínez (2016) with Spanish university students.

Equally, the existence of differences in patterns of alcohol consumption according to gender has also been proven. In all the explored indicators (consumption of alcohol risk, symptoms of dependence, and harmful consumption of alcohol), males presented higher problematic uses, which is the dominant trend in the data from the National Survey of Drug, Alcohol and Tobacco Consumption (Comisión Nacional contra las Adicciones, 2017) for Mexican youth.

Additionally, our study demonstrates an increasing public health issue related to a vulnerable population segment, since according to the Pan American Health Organization (PAHO)'s regional status report on alcohol and health in the Americas (2015), early alcohol use initiation is associated with significant increases in the risk of developing alcohol-related health problems. Furthermore, in adolescents initiating alcohol use before they turn 15, probabilities of developing alcohol disorders increase five-fold vs. the mean population, probabilities of developing dependency increase four-fold, and probabilities of suffering from car crash injuries or being involved in quarrels increase seven-fold. Finally, the PAHO mentions that alcohol consumption is the main death risk factor among individuals between the ages of 15 and 19.

On the other hand, Hiller-Sturmhöfel and Swartzwelder (2004) posit that high alcohol use in adolescents generates greater brain vulnerability, which makes cognitive deficits more likely, including learning and memory deficits, owing to hippocampal alterations, leading to lifetime problems. Similarly, Haber, Lintzeris, Proude, and Lopatko (2009) identified alcohol use as an issue with significant prevalence in individuals with psychiatric disorders. In this respect, comorbidity between substance abuse and mental health problems is greater in antisocial personality disorder, schizophrenia, and bipolar disorder, as well as anxiety disorders and emotional disorders – these two should be addressed by public health institutions as urgently as possible, as they are the two mental conditions with a greater incidence internationally.

As outlined by Villatoro, Medina-Mora et al. (2016), a trend in alcohol use in America is similar to that observed in Mexico, both at the state and national levels. Based on this, and on our results on consumption and abuse patterns among the young population, consolidating research lines on prevention and treatment, while underlining risk factors and protection factor promotion, proves absolutely necessary. This will help reduce alcohol use effects such as mortality, violence, and other risk behaviors.

The difficulty in extrapolating results is the most noticeable limitation of this work. This is due to the fact that convenience sampling was used, and also to the difficulties inherent to the use of a cross-disciplinary design, i.e., the impossibility of establishing causality and the difficulty of determining baseline values for comparison among populations and time periods. Self-report instruments' characteristics (social desirability) should also be kept in mind. Efforts were made to offset such difficulties by ensuring anonymity and data confidentiality.

Regarding prospective lines of action, the study underlines the need to carry out a more profound comprehensive analysis of this problem, to design and implement integrated multi-level prevention and intervention programs, since we are dealing with a true social and medical challenge.

Conflicts of interest

The authors declare no conflicts of interest in relation to this article.

Acknowledgments

We are grateful to Professor Dra. Lourdes Cortés for her support in the application of the instrument in Yucatan, and to all the young people and managers of the schools that allowed the application of the instrument in Puebla, Tlaxcala, and Mérida.

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