

Validation of the AUDIT scale and factors associated with alcohol use disorder in adolescents: results of a national Lebanese study

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Abstract

Background

This study objective was to evaluate the prevalence as well as factors (smoking, internet addiction, social phobia, depression, child abuse and bullying) associated with alcohol use disorder among a representative sample of Lebanese young people, in addition to validating and confirming psychometric properties of the AUDIT scale.

Methods

A cross-sectional study, conducted between January and May 2019, enrolled 1810 adolescents aged between 14 and 17. Alcohol dependence was defined as a high AUDIT score. A principal component analysis technique to confirm the validity of the construct of the AUDIT scale score was done and a confirmatory analysis to assess the structure of the instrument was conducted.

Results

The mean AUDIT score was 6.46 ± 8.44 and high risk of hazardous alcohol drinking was found in 28% of adolescents. One factor solution of the AUDIT scale had been found after running the factor analysis and the confirmatory factor analysis demonstrated that the $\chi^2/df=2.4$, the Steiger-Lind RMSEA was 0.10 [0.084-0.155] and the Joreskog GFI equaled 0.91 and AGFI equaled 0.92. Higher cigarette (Beta=0.372) and waterpipe (Beta=0.319) dependence, higher child sexual (Beta=0.581) and neglect (Beta=0.106) abuse, higher internet addiction (Beta=0.088), separated parents compared to living together (Beta=3.202) and higher bullying victimization (Beta=0.143) were significantly associated with higher AUDIT scores.

Conclusion

Alcohol dependence seems to be influenced by several risk factors among the Lebanese adolescents such as cigarette and waterpipe dependence, higher internet addiction, bullying, and child sexual and neglect abuse. Parents and healthcare professionals could use this data to influence intervention efforts.

Background

Adolescence is one of human development's quickest stages. It is a transition period between being a child and becoming an adult, characterized by developing knowledge and skills, learning how to handle emotions and relationships, and gaining qualities and skills that are important for young people to enjoy and take on adult roles¹ ; one of the issues an adolescent may face is problematic alcohol consumption. Despite their known direct impact on general health outcomes, alcohol use disorders are pervasive and endemic among adolescents. AUD is thought to be a pediatric-onset condition with one in twenty cases disclosing problems related to alcohol drinking as fighting with family or friends and skipping school, and needs early detection and screening to initiate the appropriate early intervention^{2,3}. For example, in 2011,

90% of European teenagers between 15 and 16 years of age had, at least once in their lifetime, consumed alcohol⁴. Of those between the ages for 12 and 20 surveyed in the United States in 2014, 50.9 per cent were binge drinkers and 13.7 per cent were heavy drinkers⁴.

Alcohol abuse and dependence, which were terms used in DSM-4, are now replaced by Alcohol Use Disorder (AUD) in DSM-5, characterized by a dysfunctional alcohol consumption pattern resulting in clinically significant disability or anxiety as evidenced by various psychosocial, behavioral or physiological characteristics⁵. In its Global Status Report on Alcohol and Health 2018, the World Health Organization (WHO) stated that unhealthy alcohol use contributes more than 5% of the global disease burden⁶.

Multiple risk factors are found to be correlated with AUD among adolescents. The first and third most fatal amendable risk factors affecting wellbeing in the United States are cigarette smoking and excessive alcohol consumption⁷. Even though they tend to co-occur, previous studies showed that smoker adolescents present higher vulnerability to alcohol use disorders⁸. In addition, internet is one of the most mainstream media used among youth to strengthen their competitiveness, but it's widely massive use has been linked to many negative effects⁹ such as depression¹⁰, anxiety¹¹, cyberbullying¹², and alcohol abuse¹³.

Social anxiety, defined as an extreme fear of being assessed negatively by others, has been reported as a potentially significant variable affecting the use of alcohol and cigarettes in adolescents¹⁴; Nevertheless, the association between anxiety disorders and teenage alcohol consumption is still indistinct^{15,16}. Moreover, depression may lead to substance use as a strategy for medicating distressing affect¹⁷; indeed, depression was a suicide and alcohol misuse risk factor including among adolescents¹⁸.

Besides, child maltreatment includes several subtypes: sexual, physical, emotional abuse and neglect. LeTendre et al. investigated the association between two major public health risks unfavorable childhood and alcohol consumption later in life¹⁹. The increasing rate of teenage drinking and the rising probability that a substance use disorder occurs later in life were associated with psychological, physical and sexual abuse^{19,20}. Later in 2015, Shin et al. suggested that among four forms of childhood abuse, emotional abuse could be the main driver of pathological drinking among child maltreatment victims²¹.

Bullying, in its physical, verbal, relational, or cyber forms, is another factor incriminated in higher alcohol use disorder. Roughly 15–30% of youth report being intimidated at a certain point in their life^{22,23}. Victimized bullying is aligned with variable issues of conduct and mental wellbeing²⁴ according to the type of aggression¹⁸ leading to alcohol use, suicidal ideation and illegitimate drug use²⁵.

East Mediterranean countries are majority Muslim²⁶. As a consequence, alcohol consumption is commonly believed to be underrepresented due to its ban in Islam and the conservative type of society, where talk of alcohol consumption is still a taboo²⁶. Regardless of that, in Karam et al., 2007, in most

Arab countries, the most widely used psychoactive agent by college students was alcohol²⁷. Additionally, a systematic review noted that in Lebanon, an epidemiological work on the consumption of alcohol and its effects was typically carried out as a result of theological diversity and more liberal attitudes in the society²⁸. Moreover, the Lebanese situation may contribute majorly in affecting alcohol use among young people. Actually, since the decrees prohibiting the sale of alcohol to minors date back to the 1940s and 1960s, Lebanon is characterized by weak alcohol policies². In 1943 the main regulation (number 340) was issued then amended in 1993, and forces a four-dollar fine on individuals advertising alcoholic beverages to minors under eighteen years of age and putting them in an inebriated state. Also, penalties of six dollars and fines identical to thirteen dollars on proprietors and staff of bars, pubs or other similar public places selling alcoholic bracer to tanked people or minors beneath the age of 18, or placing a person in an intoxicated situation are imposed by the preconditions of the same statement (Article 626 changed by Law 239/1993)². Furthermore, Lebanon is currently denoted by low alcohol prices, broad alcohol accessibility and availability with alcohol being easily reachable especially in the availability of inexpensive alcohol markets promoting alcoholic beverage to young drivers and absence of a national legislation to impose random sobriety checkpoints furthermore increasing alcoholic drinking problem among adolescents². In addition, the unavailability of a law that controls all alcohol advertising and the alcohol industry's free curb showcasing and deals practices, leads to heavy alcohol advertising on several media sources and thus aggravating alcohol use in youth².

In a nationwide representative sample of Lebanese adults between eighteen and thirty-four years of age, the prevalence of twelve month alcohol abuse in 2011 was 6.2 percent, with men, students, employees, Druze and Christians being more likely involved in comparison with Muslims²⁹. Nonetheless, very few alcohol-related research among Arab and Lebanese adolescents were gathered. The outcome of the Global School-based Student Health Survey (GSHS) among students aged thirteen-seventeen years in seventy three countries, counting sixteen countries within the Eastern Mediterranean Region³⁰ showed that 23.8 percent of males and 14.7 percent of females drank at least one alcohol beverage on at least one day during the 30 days leading up to the study, 18.4 percent of males, 9 percent of females ever drank so much alcohol that they were truly intoxicated one or more times during their life and 75.7 percent of males and 65.5 percent of females drank alcohol for the first time before age 14 years, among students who ever had a drink of alcohol other than a few sips². Most importantly, as already mentioned above, AUD is considered a pediatric disorder that needs early detection and screening in order to initiate the suitable early intervention³. There are no antecedent study documented in Lebanon concerning the predominance and the variables related to AUD among adolescents and considering the extent of alcohol-related public health burden and the associated morbidity and mortality, research in Lebanon is needed on the identification of the prevalence, the discernment of construct that provide the alcohol misuse evolution, as well as factors that encourage durability.

On another hand, the Alcohol Use Disorder Identification Test (AUDIT), is an international ten item screening instrument, established by the WHO, to appraise alcohol consumption, drinking habits, and and issues related to alcohol³¹. It is a validated questionnaire, extensively employed in many nations, for

detecting both AUD (harmful: An alcohol consumption pattern that causes physical or mental health problems and dependent drinking: A cluster of mental, physiological and behavioral symptoms that may evolve after prolonged use of alcohol) and at-risk alcohol consumption (hazardous drinking: An alcohol use pattern that increases the risk of physical, mental and social harm to the consumer)³² in adult and adolescent target groups^{33–35}. This tool has also been validated among prisoners in the United Arab Emirates³⁶, among Lebanese university students³⁷ but there is no information on its validation among adolescents in Lebanon.

Accordingly, our study aims to evaluate the prevalence as well as factors (smoking, internet addiction, social phobia, depression, child abuse and bullying) associated with AUD among a representative sample of Lebanese young people, in addition to validating and confirming psychometric properties of the AUDIT scale.

Methods

Participants

This analysis was a cross-sectional study that took place between January and May 2019. Out of 2000 questionnaires distributed; 1810 (81.0%) were completed and collected back. Participants were enrolled using a proportionate random sample of all Lebanese Mohafazat (Beirut, Mount Lebanon, Central, South and Bekaa) schools. A total of eighteen private schools was contacted; two refused to participate. Those who accepted were located as follows: 4 in Beirut; 2 in South Lebanon; 6 in Mount Lebanon; 2 in North Lebanon; and 2 in Bekaa. Students between the ages of fourteen and seventeen were selected at random from each school. Students were allowed to accept or refuse to participate in the research, without any financial compensation in return for individual participation. Excluded were the students who refused to fill out the questionnaire. The methodology used in this study is similar to the one used in previous papers^{38–40}.

Questionnaire

The questionnaire used was in Arabic, the native language of Lebanon, needing approximately 60 minutes to be completed. Students were asked to fill the questionnaire in the classrooms to avoid their parents' influence while answering the questions. At the end of the process, the completed questionnaires were collected back in closed and sent for data entry. During the data collection process, the anonymity of the participants was guaranteed.

The first part evaluated the participants' sociodemographic information (i.e. age, gender, smoking status, parents' status). The heights and weights of participants were self-reported to calculate the Body Mass Index (BMI) (kg/m^2). The household crowding index was calculated by dividing the number of persons living in the house and the number of rooms in the house besides the bathroom and the kitchen⁴¹. The second part of the questionnaire was composed of the different scales used:

The Alcohol Use Disorders Identification Test (AUDIT)

This self-reported tool assesses alcohol use, drinking patterns, and alcohol-related issues⁴². Hazard alcohol disorder (HAD) is considered when the patients score 8 or more ($\alpha_{\text{Cronbach}} = 0.978$).

Liebowitz Social Anxiety Scale (LSAS)

The self-reported scale features 24 items graded in a Likert scale from 0 to 3, which are divided into two subcategories (13 questions relate to performance anxiety and 11 concern social situations)^{43,44} (α_{Cronbach} total score = 0.969, α_{Cronbach} fear subscale = 0.952, α_{Cronbach} avoidance subscale = 0.951).

Internet Addiction Test (IAT)

The Arabic version⁴⁵ consisted of twenty items, with Likert type responses varying between 0 = does not apply/never and 5 = always applies. Higher scores defining higher internet addiction ($\alpha_{\text{Cronbach}} = 0.925$).

Multiscore Depression Inventory for Children (MDI-C)

It consists of seventy-nine items that measure depression and its features, mainly anxiety, self-esteem, sad mood, instrumental helplessness, social introversion, low energy, pessimism and defiance⁴⁶. Higher scores indicating higher depression ($\alpha_{\text{Cronbach}} = 0.940$).

Lebanon Waterpipe Dependence Scale-11 (LWDS-11)

LWDS-11 test was used to assess waterpipe dependence⁴⁷. The LWDS-11 includes eleven items measured in four-point Likert scale ranging from zero to three, with higher scores reflecting higher waterpipe dependence ($\alpha_{\text{Cronbach}} = 0.888$).

Fagerstrom test for nicotine dependence (FTND)

This scale is composed of 6 items; yes/no items are scored from 0 to 1 and multiple-choice items are scored from 0 to 3. The higher the total Fagerström score, the more intense is the patient's physical dependence on nicotine⁴⁸ ($\alpha_{\text{Cronbach}} = 0.825$).

Child abuse self-report scale (CASRS)

This scale treated 38 items approved for the validity of content. The CASRS was divided into four categories of child abuse and neglect: psychological (14 items), neglect (11 items), physical (8 items) and sexual abuse (5 items). The format of the scale was based on a Likert style: 0 = Never 1 = Sometimes 2 = Most often 3 = Always⁴⁹. No abuse or neglect of responses is given a score of "0" and a score of "3" is given for severe abuse or neglect. Higher scores will show more childhood abuse⁵⁰. The Cronbach alpha values for each subscale were as follows: psychological (0.973), neglect (0.971), physical (0.966) and sexual (0.954).

The Illinois Bully scale

The Illinois Bully Scale is a research-validated tool that can be used to measure bullying and victimization through directly surveying students⁵¹, with higher scores reflecting higher bullying ($\alpha_{\text{Cronbach}} = 0.975$).

Translation procedure of the questionnaire

The forward and backward translation method was conducted in all the scales. One translator was in charge of translating the scales from English to Arabic, whereas a second one was involved in the translation from Arabic back to English. Discrepancies between the original and translated English versions were resolved by consensus.

Statistical analysis

The SPSS software version 25 was used to conduct data analysis. Pearson correlation was used for linear correlation between continuous variables. For categorical variables, the chi-square and Fisher exact tests were used. The Student t-test was used to compare the means of 2 groups, whereas the ANOVA test was used when comparison involved three or more groups. A stepwise linear regression was conducted, taking the AUDIT total score as the dependent variable. Independent variables entered in the final model were those that showed a $p < 0.1$ in the bivariate analysis for the elimination of confounding factors as much as possible⁵². A $p < 0.05$ was considered significant.

A principal component analysis technique to confirm the validity of the construct of the AUDIT scale score in the Lebanese population. The exploratory analysis for the validation of the AUDIT scale was conducted on half of the sample (subsample 1: $n = 905$), whereas the confirmatory analysis was conducted on the other half (subsample 2: $n = 905$). The total sample ($n = 1810$) was used for the bivariate and multivariable analysis. The Kaiser-Meyer-Olkin measurement of sampling adequacy and Bartlett's sphericity test were appropriate. The factors retained corresponded to Eigenvalues greater than one.

Second, a confirmatory factor analysis was carried out in subsample 2 using the maximum likelihood method for discrepancy function to assess the structure of the instrument. Several goodness-of-fit indicators were reported: the Relative Chi-square (χ^2/df) that serves as goodness of fit index (cut-off values: $< 2-5$), the Root Mean Square Error of Approximation (RMSEA) that tests the fit of the model to the covariance matrix (close and acceptable fit are considered for values < 0.05 and < 0.11 respectively), the Goodness of Fit Index (GFI) and the Adjusted Goodness of Fit Index (AGFI) (acceptable values are ≥ 0.90)⁵³.

In addition, Cronbach's alpha was recorded to assess the reliability analysis of the total score and subscale factors. A face validity analysis was also conducted, comparing AUDIT according to regions: Beirut (the urban capital, expected high consumption of alcohol), Mount Lebanon (Non-Muslim majority,

expected high consumption of alcohol), and other regions (rural and Muslim majority, expected lower consumption of alcohol).

Results

The sociodemographic characteristics of the participants are summarized in Table 1. The mean age was 15.42 ± 1.14 years, with 53.3% females and 25.9% smokers. In addition, 11.9% of the adolescents had separated/divorced parents. The mean AUDIT score in our sample was 6.46 ± 8.44 (median = 2); also, 507 (28.0%) had high risk of hazardous alcohol drinking (HAD) (AUDIT scores ≥ 8) [95% CI 0.259–0.301].

Validation of the AUDIT scale

Subsample 1

Factor analysis

None of the items from the AUDIT scale has been removed. We run the factor analysis of the AUDIT on the full sample (Total $n = 905$). Items converged on a one-factor solution with Eigenvalues greater than 1, accounting for a total of 85.88% of the variance. The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.832, with a significant Bartlett's sphericity test ($p < 0.001$). Moreover, a high Cronbach alpha was found for the full scale (0.978) (Table 2).

Subsample 2

Confirmatory factor analysis

A confirmatory factor analysis was run on subsample 2 ($n = 905$), using the one-factor structure obtained in Sample 1. The following results were obtained: the Maximum Likelihood Chi-Square = 257 and Degrees of Freedom = 104, which gave a $\chi^2/df = 2.4$. For non-centrality fit indices, the Steiger-Lind RMSEA was 0.10 [0.084–0.155]. Moreover, the Joreskog GFI equaled 0.91 and AGFI equaled 0.92.

Face validity

The results showed that a higher mean AUDIT score was found in Beirut (8.42) and Mount Lebanon (8.06) compared to North (5.83), South (5.29) and Bekaa (5.61) ($p < 0.001$ for the whole trend). The post hoc analysis showed that the comparison of the mean AUDIT scores was significantly different between Beirut vs North ($p = 0.002$), Beirut vs South ($p < 0.001$), Beirut vs Bekaa ($p < 0.001$), Mount Lebanon vs North ($p = 0.004$), Mount Lebanon vs South ($p < 0.001$) and Mount Lebanon vs Bekaa ($p < 0.001$) (Fig. 1). However, no significant difference was found between males and females (6.04 vs 6.82; $p = 0.056$).

Bivariate analysis

The results of the bivariate analysis showed that a higher AUDIT score was significantly found in adolescents whose parents are separated compared to those whose parents live together (12.96 vs 5.56)

and in those who smoked cigarettes (16.69 vs 3.62) or waterpipe (15.35 vs 3.53) compared to non-smokers. Furthermore, higher fear ($r = 0.276$) and avoidance ($r = 0.171$), victimization of bullying ($r = 0.383$), cigarette ($r = 0.576$) and waterpipe ($r = 0.523$) dependence, internet addiction ($r = 0.325$), anxiety ($r = 0.139$), sad mood ($r = 0.122$), instrumental helplessness ($r = 0.168$), social introversion ($r = 0.165$), low energy ($r = 0.140$), pessimism ($r = 0.2$), physiological ($r = 0.435$), neglect ($r = 0.069$), physical ($r = 0.438$) and sexual ($r = 0.468$) abuse were significantly associated with higher AUDIT scores, whereas higher self-esteem was significantly associated with lower AUDIT scores (Table 3).

Multivariable analysis

The results of a stepwise linear regression, taking the AUDIT score as the dependent variable, showed that higher cigarette (Beta = 0.372) and waterpipe (Beta = 0.319) dependence, higher child sexual (Beta = 0.581) and neglect (Beta = 0.106) abuse, higher internet addiction (Beta = 0.088), separated parents compared to living together (Beta = 3.202) and higher bullying victimization (Beta = 0.143) were significantly associated with higher AUDIT scores (Table 4).

Discussion

As far as our knowledge goes, this is the prime nationwide study to determine factors related to alcohol use disorder among adolescents. Our research revealed that tobacco and waterpipe smoking, internet addiction, sexual child abuse, neglected child, bullying and divorce in parents were associated with higher AUD among our Lebanese adolescents sample.

Concerning psychometric properties in our study, we found that the AUDIT score had an outstanding Cronbach's alpha of 0.978, in agreement with other studies^{33,35,54}. Moreover, the one-factor model of the AUDIT scale that we obtained in the Arabic version was shown to be better than the Portuguese one⁵⁵ in terms of internal consistency and number of factors, making this tool useful in recognizing risk intake, signs of addiction and unhealthy alcohol use among adolescents in Lebanon. Accordingly, the use of the AUDIT scale for the assessment of alcohol use disorder among Lebanese adolescents is recommended. However, further studies are needed to assess more validation features of the AUDIT (face validity, validation compared to physician's diagnosis).

A high prevalence (28.0%) of risk of AUD was found among Lebanese adolescents, in line with other studies^{2,56,57}. Besides the correlations with psychological factors identified in this research, this proportion may also be related to the normalization of alcohol use, to its wide availability especially in Beirut and Mount Lebanon, to the government's inaction and existing indefinite policies toward the unlawful sale of alcohol to minors, to the very low taxes on alcohol excise and low cost, the poor regulatory framework for alcohol publicizing and promoting techniques, the lack of effectively reported adverse effects of alcohol consumption and the impact of friends and cousins on the young population²⁶.

A notably higher mean AUDIT score was found in Beirut and Mount Lebanon compared to the other governorates. As stated in the methods' section, this might be related to the distribution of the religious area in Lebanon, whereas North, South and Bekaa having most of the Lebanese Muslim rural populations^{26,29}. Alcohol drinking is forbidden in the Qur'an as it is proclaimed to be a Satanic act⁵⁸. Moreover, devout believers in Islam, adhere harshly to the expressions of Muhammad⁵⁹. Abstention from alcohol use, is thought to be related first to its illegality and also to the feeling of guilt, followers of Islam may experience if they do drink⁵⁹. In that manner, adolescents raised in families where the Islamic law and faith in forbidding alcohol is practiced, may encounter little or no alcohol drinking or misuse. This distribution further corroborates the validity of the AUDIT scale.

Cigarette and waterpipe dependence and AUD

In the current study, higher cigarette smoking dependence was remarkably associated with higher AUDIT scores in agreement to other studies^{8,60}. We also found that waterpipe smoking is related to higher AUDIT scores, while few previous studies exhibited this association^{60,61}. In fact, waterpipe smoking is addictive and associated with nicotine dependence among adolescents⁶². In general, it is assumed that youth smokers are at elevated vulnerability to AUD at the equal drinking rates compared to non-smokers⁸. This was reflected by Kandel and Chen who found elevated levels of AUD at minimal quantity of alcohol drinking for teenage smokers and associated amount of cigarettes with nicotine addiction symptoms⁶³. To clarify this association, Grucza et al., 2006 suggested that a pharmacological influence on response to alcohol may result from smoking by expanding vulnerability to AUD⁸. There may also be a genetic predisposition or other obscure factors associated with the initiation of youth smoking that may assume a role in the development of AUD⁸. Adolescents' nicotine exposure may alter gene expression and brain development, thereby modifying future social reactions to other drugs, expanding susceptibility to alcohol and other substance use disorders and fortifying impacts of multiple drugs of abuse. This was evidenced by an animal study exploring the nicotine effects on the adolescent rats' central nervous system^{64 - 68}.

Internet addiction and AUD

The current study demonstrated that a higher internet addiction was associated with a higher AUDIT score in harmony with previous results⁶⁹. Internet addiction is a potentially dangerous condition that results in many negative consequences^{70,71} such as depression, anxiety isolation, loneliness⁷², loss of self-esteem and personal, social, academic problems as well, increasing the problematic use of alcohol among adolescents^{69 - 71}. Afterwards, adolescents may diverge to misuse of alcohol in order to deal with the repercussions following dysfunctional use of the internet and to escape from their reality⁶⁹. Likewise, Problematic Internet Use (PIU) and risky alcohol use may divide similar vulnerability elements alike positive attitudes toward alcohol, family history of alcoholism, and the presence of deviant peers¹³ raising the probability of appearing together, with the fact that PIU appears to antecede and increase the risky alcohol use among young people⁶⁹. Similar to other behavioral addictions, adolescents suffering from PIU may use the internet more frequently in order to produce a satisfactory effect^{73,74}. As a

compulsion, equivalent to the suggestion of Problem Behavior Therapy⁷⁵, getting involved in a problem behavior such as Internet addiction will decrease the threshold for other addictions and subsequently increase the alcohol use disorder.

Child sexual abuse, neglect and AUD

In the present study, results illustrated that higher child sexual abuse was correlated with higher AUD. Our findings are steady with other studies documenting this association among adolescents^{20,76}. Several explanatory models are proposed for the association of these two major problems. First, the relationship is likely referred to psychiatric issues, as childhood sexual victimization frequently leads to depression and anxiety⁷⁷. Youths who lack the appropriate system to manage their past bad experience and the subsequent results, may utilize alcohol to cope or escape from their traumatic childhood, and increase the requirement of alcohol trying to fix their issues and to make themselves feel much improved, leading to its misuse^{76,78} at some point.

Moreover, several studies found that antisocial behaviors can also be a consequence of childhood victimization^{79,80} and so, a strong predictor of AUD. Specialists theorized that youth displaying such delinquent practices may regularly become involved in deviant peer groups likewise advancing AUD⁷⁸. Besides, a higher neglect abuse is found to be associated with a significantly higher AUDIT scores in line with previous researches⁸¹. Unfavorable life experiences during childhood, led to the development of Post-Traumatic Stress Disorder and have had a genuine and inescapable effect on biological stress response mechanisms and mental health driving victims to respond to their previous traumatic experiences by drinking alcohol⁸². Furthermore, ignored children can't develop a valuable relationship with their inert primary caregiver and are more prone to build up a sense of vulnerability, poor social skills and companion issues^{83,84} thusly, degradation of self-confidence and self-control⁸¹

leading to more alcohol use.

Bullying and AUD

Our findings showed that higher bullying victimization was significantly associated with more alcohol use disorder, concurring previous research findings^{25,85}. Bullying itself is a major global health problem with serious consequences^{86,87}, long linked to issues with self-worth^{88,89}. Besides, victimized adolescents have a propensity to have loneliness, depression, anxiety or physical symptoms with no known organic cause like headaches, difficulty breathing or abdominal pain⁹⁰. It is suggested that alcohol use disorder is a way to deal with symptoms of mood disorders developed after being bullied⁹⁰, to ease the anxiety and escape from reality. Others may use alcohol as a way to emphasize their social image and to improve their previously diminished self-worth⁹⁰. Additionally, youth tend to seek the peer environment because they can't solve bullying themselves, which seems to reinforce the susceptibility to engage in this antisocial behavior⁸⁵.

Separated Parents and AUD

In this framework, more alcohol use disorder was also found in adolescents whose parents are separated, consolidating previous findings^{91,92}, compared to those whose parents live together. Deviant conduct is probably produced by low levels of attachment and loyalty to the family resulting from decrease in infant monitoring and parental involvement that pursue separate usually compatible with social control hypothesis⁹².

Moreover, these findings may be highlighting the important role parents play in influencing the behavior of their children towards alcohol and actual alcohol consumption^{26,92}. Parental absence, for instance, may result in a reduction in fruitfulness of parenting⁹³ and increased access to alcohol, and increased access to alcohol, thereby increasing the chance of drinking⁹⁴. In addition, as youth need to have emotional exigency met while experiencing divorce, prominent connection with substance-using peers will be developed^{95,96}. Peers are thought to be potentially important in determining drinking habits²⁶.

Poor parental observation could thus establish a cascade of development that leads to deviant peers, better alcohol exposure and, eventually, quicker drinking initiation⁹².

Clinical Implications

The findings of this study carry important implications for interventions. As per the nearness of immense gaps in protecting adolescents in the laws leading alcohol control in Lebanon, there is a pressing need to set new and actualized approaches to manage alcohol sale to the young, to decrease the density of alcohol shops, and to incorporate civic messages supporting endorsement of these arrangements²⁸.

In addition, interventions should fundamentally focus on authorizing or boosting the legal minimum drinking age to minimize drinking by young people⁹⁷, and to reduce morbidity and mortality related to alcohol as it has progressively become the second leading reason of road accidents in Lebanon (as reported by Red Cross Lebanon)².

Furthermore, a national alcohol harm reduction plan based on evidence should be actualized as it has been shown to be successful in averting and lessening damage from alcohol use². The World Health Organization (WHO) implemented the Global Strategy to Reduce Harmful Alcohol Use in May 2010, which showed progress in expanding the commitment of successful governments to encourage effective action while combating the harmful use of drug, by targeting one or more regions, including alcohol trading or promoting, costing and accessibility, and drinking and driving initiatives^{97 - 104}.

Also, families, schools, public health and communities have to alert youth about alcohol consumption and focus on its negative aspects¹⁰⁵. To begin with, families are one of the main sources that drive adolescents into alcohol consumption via making it accessible^{2,100,103,106}; therefore, their role should be incorporated as part of any national study as they have to be aware and put effort into preventing and

restricting the availability of alcohol at home^{100,103,106}. Quite importantly, parent-child communication about alcohol use and its associated harms is also important in preventing alcohol use disorder².

Second, reinforcing school-based alcohol awareness and its related dangers and incorporation of an available confidential academic-based counseling is essential for the prevention of AUD².

At the level of community, awareness' messages are required since they have a huge impact on influencing youth before they reach high school, parents, and larger community on how the interaction with alcohol should be by highlighting the risks of alcohol consumption risks, taking the problem into public conversation and helping to promote effective policy implementation^{26,104}. Suggestions should also call attention to stop or regulate the alcohol advertising and marketing companies targeting the youth population².

To reduce underage drinking, prevention efforts should involve not only young people and adults in attitudinal dialogs, but also community standards on underage drinking¹⁰⁷, including a community based approach would help minimizing, clearing, preventing harms related to alcohol. Indeed, long-term programs and teaching styles that involve interaction with parents and the community concerned are shown to have a long enduring and effective impact on afterward alcohol use¹⁰⁸. Finally, implementation of medical and rehabilitation services, in addition to more research related to the matter, are also needed²⁶.

Limitations

This research was not free of limitations. Few potential weaknesses are worth to mention. First, the current study is limited by its cross-sectional design and thus, showed risk factor association with Alcohol Use Disorder but could not establish causality. In addition, as in Lebanon, a small country, eighteen religious communities share their convictions freely, some still perceive alcohol as a taboo, and as a consequence some schools refused to participate in our investigation. Participants were analyzed using a score tool and not through a clinical assessment test, therefore, we couldn't affirm the precision of responses; a non-differential information bias is thus expected. A selection bias is also possible, related to the refusal of some schools to participate.

Conclusion

To conclude, our study examined the different factors associated with alcohol use disorder among Lebanese adolescents, using a validated tool. The findings revealed that more alcohol use disorder was found with cigarette and waterpipe dependence, higher internet addiction, bullying, and child sexual and neglect abuse, and youth whose parents are separated. Recognizing these factors is important for parents and healthcare professionals who can use this data early on to influence intervention efforts. Public announcements are also needed to raise conscienceless among all workers, including adolescents, their mother and father and the wider community. The prevalence of alcohol use disorder found in our

study should enforce the government to include a minimum legal age to drink, regulate advertising of alcohol, policies toward those who sell alcohol to minors and marketing particularly those targeting adolescents. Intensified efforts are needed toward collecting data and determining the extent of alcohol consumption and their translation into evidence-based guidelines that can eventually be used to direct policy and practice. Moreover, further studies are necessary to confirm causal relationship between the possible factors and alcohol use disorder among Lebanese adolescents.

Abbreviations

GSHS

Global School-based Student Health Survey

BMI

Body Mass Index

AUDIT

Alcohol Use Disorders Identification Test

LSAS

Liebowitz Social Anxiety Scale

IAT

Internet Addiction Test

MDI-C

Multiscore Depression Inventory for Children

LWDS-11

Lebanon Waterpipe Dependence Scale-11

FTND

Fagerstrom test for nicotine dependence

CASRS

Child abuse self-report scale

RMSEA

Root Mean Square Error of Approximation

GFI

Goodness of Fit Index

AGFI

Adjusted Goodness of Fit Index

HAD

hazardous alcohol drinking

Declarations

Ethics Approval and Consent to Participate

The Psychiatric Hospital of the Cross Ethics and Research Committee approved this study protocol (HPC-012-2019). The students' parents gave their written informed consent before starting the data collection.

Consent for publication: not applicable.

Availability of data and materials: The authors do not have the right to share any data information as per their institutions policies.

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Authors' contributions: MS, SO and SH conceived and designed the survey. CH, PS and SH were involved in the statistical analysis and data interpretation. JH wrote the manuscript. RH, PS and HS reviewed the manuscript. All authors read the manuscript, critically revised it for intellectual content, and approved the final version.

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Tables

Table 1: Sociodemographic characteristics of the sample population (N=1810)	
	Frequency (%)
Gender	
Male	844 (46.7%)
Female	963 (53.3%)
Parents status	
Living together	1581 (88.1%)
Separate	213 (11.9%)
Smoking status	
Yes	468 (25.9%)
No	1342 (74.1%)
Mean \pm SD	
Age (years)	15.42 \pm 1.14
BMI (kg/m²)	21.95 \pm 4.21
Household crowding index	1.01 \pm 0.64

Table 2. Principal component analysis results of the promax rotation of the AUDIT scale.		
Question	Item	Loading factor
Has a relative or friend or a doctor or another health worker been concerned about your drinking or suggested you cut down?	10	0.965
Have you or someone else been injured as a result of your drinking?	9	0.964
How often during the last year have you had a feeling of guilt or remorse after drinking?	7	0.963
How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session?	6	0.956
How often during the last year have you been unable to remember what happened the night before because you had been drinking?	8	0.951
How often during the last year have you found that you were not able to stop drinking once you had started?	4	0.943
How often do you have six or more drinks on one occasion?	3	0.938
How often during the last year have you failed to do what was normally expected from you because of drinking?	5	0.929
How many drinks containing alcohol do you have on a typical day when you are drinking?	2	0.920
How often do you have a drink containing alcohol?	1	0.711

Table 3: Bivariate analysis taking the AUDIT total score as the dependent variable		
	AUDIT total score	P -value
	Mean ± SD	
Gender		
Male	6.04 ± 8.43	0.056
Female	6.82 ± 8.43	
Parents status		
Living together	5.56 ± 8.01	<0.001
Separate	12.96 ± 8.67	
Cigarette smoking status		
Yes	16.69 ± 7.84	<0.001
No	3.62 ± 6.07	
Waterpipe smoking status		
Yes	15.35 ± 8.62	<0.001
No	3.53 ± 5.97	
	Correlation coefficient	P -value
Liebowitz- fear score	0.276	<0.001
Liebowitz- avoidance score	0.171	<0.001
Bullying/victimization score	0.383	<0.001
LWDS total score	0.523	<0.001
FTND total score	0.576	<0.001
IAT score	0.325	<0.001
House crowding index	0.030	0.214
Physical activity score	0.011	0.657
MDIC - anxiety	0.139	<0.001
MDIC - self esteem	-0.188	<0.001
MDIC – sad mood	0.122	<0.001
MDIC-Instrumental helplessness	0.168	<0.001
MDIC-social introversion	0.165	<0.001

MDIC- low energy	0.140	<0.001
MDIC – pessimism	0.200	<0.001
MDIC defiance	0.146	<0.001
Psychological abuse scale	0.435	<0.001
Child abuse neglect scale	0.069	0.006
Child abuse physical scale	0.438	<0.001
Child abuse sexual scale	0.468	<0.001

Table 4: Multivariable analysis: Linear regression taking the AUDIT score as the dependent variable.					
Variable	Unstandardized Beta	Standardized Beta	p-value	Confidence Interval	
				Lower	Upper
FTND – score	0.372	0.135	<0.001	0.210	0.534
LWDS-11 - score	0.319	0.353	<0.001	0.268	0.370
Child abuse sexual scale	0.581	0.266	<0.001	0.497	0.665
Child abuse neglect scale	0.106	0.129	<0.001	0.077	0.135
IAT - score	0.088	0.195	<0.001	0.071	0.104
Parents status (separate vs. living together*)	3.202	0.133	<0.001	2.343	4.060
Bullying/victimization score	0.143	0.124	<0.001	0.098	0.189
Variables entered in the model: gender, parents' status, IAT score, LWDS-11 score, FTND, Liebowitz fear score, Liebowitz avoidance score, MDIC – anxiety, MDIC - self-esteem, MDIC – sad mood, MDIC-Instrumental helplessness, MDIC-social introversion, MDIC- low energy, MDIC – pessimism, MDIC defiance, Psychological abuse scale, Child abuse neglect scale, Child abuse physical scale, Child abuse sexual scale and Bullying/victimization score.					
*Reference group					

Figures

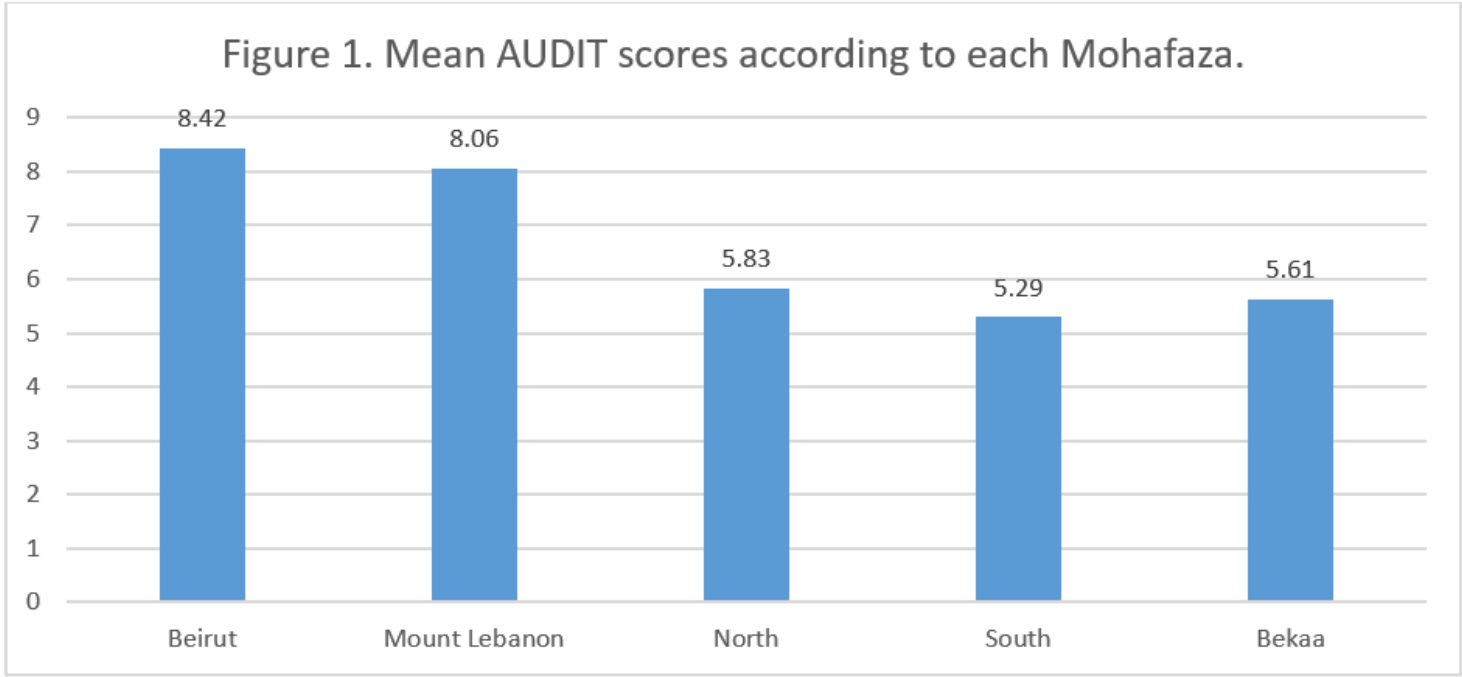


Figure 1

Mean AUDIT scores according to each Mohafaza.