

EFFECTIVENESS OF DIFFERENT METHODS FOR THE DETECTION OF BINGE DRINKING IN DENTISTRY STUDENTS

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The purpose of this study was to estimate the alcoholic beverage consumption among undergraduate students of a Dentistry Course and compare the effectiveness of screening methods for the detection of binge drinking. A total of 284 undergraduate students participated in the research. We used the full AUDIT and their reduced forms (AUDIT-3 and AUDIT-C). In addition, a ROC curve was created and its area was calculated. Of the students, 91.0% and 90.6% of the male and female genders, respectively, reported alcohol beverage consumption. Bing-drinking behavior occurred in 69.2% of the men and in 52.4% of the women. The 3 methods showed good discriminatory ability. For the women, there was a significant difference between the AUDIT-3 and AUDIT-C. Both the complete version of AUDIT and its reduced forms presented good discriminatory ability.

Descriptors: Alcoholism; Students; Diagnosis; Validity of Tests.

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EFETIVIDADE DE DIFERENTES MÉTODOS PARA DETECÇÃO DE *BINGE DRINKING* EM ESTUDANTES DE ODONTOLOGIA

Objetivou-se neste trabalho estimar o comportamento de beber entre estudantes de Odontologia e comparar a efetividade de métodos de rastreamento para detecção do *binge drinking*. Participaram 284 estudantes. Utilizou-se o AUDIT completo e suas formas reduzidas (AUDIT-3 e AUDIT-C). Construiu-se a curva ROC e estimou-se sua área. Dos estudantes, 91,0 e 90,6% do sexo masculino e feminino, respectivamente, relataram consumir bebidas alcoólicas. O *binge drinking* ocorreu em 69,2% dos meninos e 52,4% das meninas. Os três métodos apresentaram boa capacidade discriminatória. No sexo feminino, houve diferença entre o AUDIT-3 e o AUDIT-C. Observou-se alta prevalência de *binge drinking* entre os estudantes. A versão completa e as reduzidas do AUDIT mostraram-se efetivas para detecção do *binge drinking*.

Descritores: Alcoolismo; Estudantes; Diagnóstico; Validade dos Testes.

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El objetivo de ese trabajo fue estimar el comportamiento de beber entre estudiantes de Odontología y comparar la efectividad de métodos de rastreo para detección del *binge drinking*. Participaron 284 estudiantes. Se utilizó el AUDIT completo y sus formas reducidas (AUDIT-3 y AUDIT-C). Se construyó la curva ROC y se estimó su área. De los estudiantes, 91,0% y 90,6% del sexo masculino y femenino, respectivamente, relataron consumir bebidas alcohólicas. El *binge drinking* ocurrió en un 69,2% de los niños y 52,4% de las niñas. Los tres métodos presentaron buena capacidad discriminatoria. En el sexo femenino, hubo diferencia entre el AUDIT-3 y el AUDIT-C. Se observó alta superioridad de *binge drinking* entre los estudiantes. La versión completa y las reducidas del AUDIT se mostraron efectivas para detección del *binge drinking*.

Descriptorios: Alcoholismo; Estudiantes; Diagnóstico; Validez de las Pruebas.

Introduction

Adolescence is a period characterized by substantial physiological and psychological changes; thus, making the youth more susceptible to external agents such as alcohol and other psychotropic substances⁽¹⁾.

There is a significant increase in the consumption of alcoholic beverages when they reach college⁽²⁾. Some authors⁽³⁻⁴⁾ emphasize that the quantity and frequency of alcohol consumption among college students is high among both freshmen and seniors, with binge drinking being the common denominator among them.

The term binge drinking is used to define the consumption of an excessive amount of alcohol in a short period of time. Binge drinking is defined as having 5 drinks for men and 4 for women, all in a row⁽⁵⁾.

This behavior greatly increases not only the risk of developing dependence, but also the occurrence of negative consequences related to the alcohol use, which intensifies as the frequency of episodic intoxication increases⁽⁶⁾.

Thus, the early diagnosis of this type of behavior is essential, and the employment of simple, reliable and valid screening tools for the early detection of binge drinkers⁽⁷⁾ becomes a necessity.

The WHO (World Health Organization) developed the Alcohol Use Disorders Identification Test (AUDIT) to be used for the early detection of risk drinking in different cultures and among different age groups⁽⁸⁾. The AUDIT consists of a questionnaire containing 10 items with recommended cut-off points for the specific scores. In the original study, the total score of 8 was recommended as the cutoff point for risk drinking⁽⁹⁾. However, other studies recommend the total score of 5⁽¹⁰⁾ or even 10⁽¹¹⁾.

The AUDIT or its abbreviated forms AUDIT-3 and AUDIT-C are recommended for the identification of binge drinking behaviors⁽¹²⁾. The AUDIT-3 refers to the third question of the AUDIT, and the AUDIT-C refers to the first three questions of this tool.

These reduced forms were developed for clinical use⁽¹³⁾; however, it can also be extremely useful in large population studies. Several studies using adult samples were conducted to test the effectiveness of the reduced versions⁽¹⁴⁻¹⁵⁾, and to establish cut-off points for the identification of binge drinking behavior.

Considering the inherent characteristics of college students, more thorough evaluations of the AUDIT reduced form's effectiveness in detecting binge drinking within this specific population becomes necessary.

Thus, the objective of this study was to evaluate the drinking behavior of students in a dentistry undergraduate course and compare the effectiveness, of the full version of Alcohol Use Disorders Identification Test (AUDIT) and its reduced forms (AUDIT-C and AUDIT-3), in detecting binge drinking.

Casuistry and Methods

Study Design, Sample Outlining, and Procedures

This is a cross-sectional validation study.

All students enrolled in the undergraduate program of the School of Dentistry of Araraquara - UNESP (n = 375) in 2011, were invited to participate in this research. Only those who have consented to the Term of Free and Cleared Consent (n = 284) were accepted, representing a compliance rate of 75.7%. The students were advised of the seriousness of the questionnaire.

The questionnaires were anonymous and self-reported in the classroom, during normal school hours. The administered time was scheduled beforehand with the teacher responsible for the course given at that time.

This study was approved by the Ethics Committee of the School of Dentistry of Araraquara - UNESP (protocol 30/10).

Study Variables and Measuring Tools

The AUDIT questionnaire (Alcohol Use Disorders Identification Test) developed by the World Health Organization (WHO) was employed for the identification of alcohol use disorders⁽¹⁶⁾. All classifications related to the alcoholic beverage consumption were conducted according to the literature⁽¹⁶⁾. This study employed the Portuguese version of the AUDIT manual⁽¹⁷⁾.

The binge drinking identification employed the gold-standard question proposed in the literature (Figure 1)⁽¹⁸⁾. The participants who reported engaging in this behavior for at least 2 or 3 times a month were classified as binge drinkers.

| Gender | Question | Reply |
|--------|--|---|
| Male | In the past 30 days, how many times did you consume 5 or more drinks on row? | <input type="checkbox"/> none <input type="checkbox"/> once <input type="checkbox"/> two or three times <input type="checkbox"/> once or twice a week <input type="checkbox"/> 3 or 4 times a week <input type="checkbox"/> 5 or 6 times a week <input type="checkbox"/> almost every day <input type="checkbox"/> every day <input type="checkbox"/> two or more times a day |
| Female | In the past 30 days, how many times did you consume 4 or more drinks on a row? (the reply options are the same as the previous ones) | |

Figure 1 - Gold-standard question for detecting binge drinking⁽¹⁸⁾.

The economic status was classified according to the 2008 Brazil Criteria proposed by the Brazilian Association of Population Studies (ABEP). For the sample characteristics were also collected information such as, gender, age, and course year.

Data Analysis

Pilot Study

To assess the AUDIT intra-examiner reproducibility, prior to the data collection, a pilot study was performed, where the researcher applied the tool in duplicate, with

one week interval between the replies to the questionnaire. Fifty students participated during this stage. The reply data to each AUDIT item was submitted to Kappa statistic (κ) with linear weighting.

Sample Characteristics and Effectiveness of the Binge Drinking Detection

A descriptive statistical analysis was performed. The prevalence of the different alcohol consumption behaviors was estimated by point and confidence intervals of 95% ($CI_{95\%}$).

An estimation of the sensitivity, specificity, accuracy, and verisimilitude ratios for positive and negative test was performed to determine the effectiveness of the different methods (AUDIT, AUDIT-C and AUDIT-3) in detecting binge drinking. A ROC curve was constructed, and its area (AUROC) was calculated for each screening method. The comparison between areas was performed by the z test; with a significance level of 5%.

Results

The AUDIT questions demonstrated adequate reproducibility ($\kappa=0.643-1.00$), as well as of the students classification according to their drinking behavior ($\kappa=0.694$), which attests to its reliability in the sample.

The study included 284 dentistry students of which 65 (23.0%) were freshmen, 58 (20.5%) were sophomores, 47 (16.7%) were juniors, 65 (23.0 %) were seniors, and

48 (17.0%) attended the fifth year. The average age was of 21.18 (SD = 2.11) years; 70.8% of participants were females. From an economic perspective, 159 (56.0%) students belong to the class A (average monthly income from R\$ 8,295 to R\$ 11,480); 114 (40.1%) to the Class B (average monthly income from R\$ 2,656 to R\$ 4,754), and only 11 (3.9%) belong to Class C (average monthly income from R\$ 962.00 to R\$ 1,454).

The alcohol consumption was reported by 91.0% ($CI_{95\%} = 84.6$ to 97.40%) of the males and 90.6% $CI_{95\%} = 86.6$ to 94.6%) of the females. The binge drinking, detected by the gold standard query, was adopted by 69.2% $CI_{95\%} = 58.9$ to 79.5%) and 52.4% $CI_{95\%} = 45.6$ to 59.2%).

Table 1 shows the classification of the individuals according to the drinking behavior⁽¹⁶⁾. It is noteworthy that three female students failed to adequately complete the AUDIT questionnaire; thus, resulting in their exclusion from the analysis.

Table 1 - Classification of the individuals according to the drinking behavior, Araraquara, 2011.

| Drinking behavior | Gender | | | | | |
|-----------------------------|--------|--------|-------------|--------|--------|-------------|
| | Male | | | Female | | |
| | n | % | IC95% | n | % | IC95% |
| Non drinker | 7 | 8.97 | 2.59-15.35 | 19 | 9.36 | 5.35-13.37 |
| Moderate Drinking | 25 | 32.05 | 21.63-42.47 | 117 | 57.64 | 50.84-64.44 |
| Risk drinking pattern | 27 | 34.62 | 23.99-45.25 | 50 | 24.63 | 18.70-30.56 |
| High risk drinking pattern | 7 | 8.97 | 2.59-15.35 | 10 | 4.93 | 1.95-7.91 |
| Possible alcohol dependence | 12 | 15.38 | 7.32-23.44 | 7 | 3.45 | 0.94-5.96 |
| Total | 78 | 100.00 | | 203 | 100.00 | |

It is also significant the low number of nondrinkers in the sample, and the high prevalence of possible alcohol dependence among male students.

Table 2 shows the effectiveness study of the AUDIT and their reduced forms.

Table 2 - Effectiveness of the full version of the Alcohol Use Disorders Identification Test (AUDIT) and its reduced forms (AUDIT-3 and AUDIT-C) in detecting binge drinking among dentistry students by gender, Araraquara, 2011.

| Version | AUROC (CI95%) | | Cutoff Point | | Sensitivity | | Specificity | | *RV+ | | *RV- | |
|---------|------------------------|------------------------|------------------------|------|-------------|--------|-------------|--------|------|-------|------|------|
| | #M | #F | #M | #F | #M | #F | #M | #F | #M | #F | #M | #F |
| | AUDIT | 0.881 (0.788-0.943) | 0.893 (0.842-0.932) | =0 | =0 | 100.00 | 100.00 | 0.00 | 0.00 | 1.00 | 1.00 | - |
| | | | >0 | >0 | 100.00 | 100.00 | 29.17 | 20.00 | 1.41 | 1.25 | 0.00 | 0.00 |
| | | | >1 | >1 | 98.15 | 98.15 | 45.83 | 43.16 | 1.81 | 1.73 | 0.04 | 0.04 |
| | | | >2 | >2 | 96.30 | 94.44 | 58.33 | 58.95 | 2.31 | 2.30 | 0.06 | 0.09 |
| | | | >3 | >3* | 96.30 | 90.74 | 66.67 | 73.68 | 2.89 | 3.45 | 0.05 | 0.13 |
| | | | >4 | >4 | 92.59 | 82.41 | 70.83 | 81.05 | 3.17 | 4.35 | 0.10 | 0.22 |
| | | | >5 * | >5 | 90.74 | 75.93 | 75.00 | 86.32 | 3.63 | 5.55 | 0.12 | 0.28 |
| | | | >6 | >6 | 79.63 | 70.37 | 75.00 | 89.47 | 3.19 | 6.69 | 0.27 | 0.33 |
| | | | >7 | >7 | 74.07 | 56.48 | 75.00 | 93.68 | 2.96 | 8.94 | 0.35 | 0.46 |
| | | | >8 | >8 | 72.22 | 49.07 | 79.17 | 93.68 | 3.47 | 7.77 | 0.35 | 0.54 |
| AUDIT-3 | 0.859 (0.761-0.927) | 0.847 (0.790-0.893) | =0 | =0 | 100.00 | 100.00 | 0.00 | 0.00 | 1.00 | 1.00 | - | 0.00 |
| | | | >0 * | >0 * | 96.30 | 82.41 | 66.67 | 82.65 | 2.89 | 4.75 | 0.05 | 0.21 |
| | | | >1 | >1 | 75.93 | 41.67 | 79.17 | 95.92 | 3.64 | 10.21 | 0.30 | 0.61 |
| | | | >2 | >2 | 53.70 | 20.37 | 91.67 | 98.98 | 6.44 | 19.96 | 0.51 | 0.80 |
| | | | >3 | >3 | 11.11 | 1.85 | 95.83 | 100.00 | 2.67 | - | 0.93 | 0.98 |

(continue...)

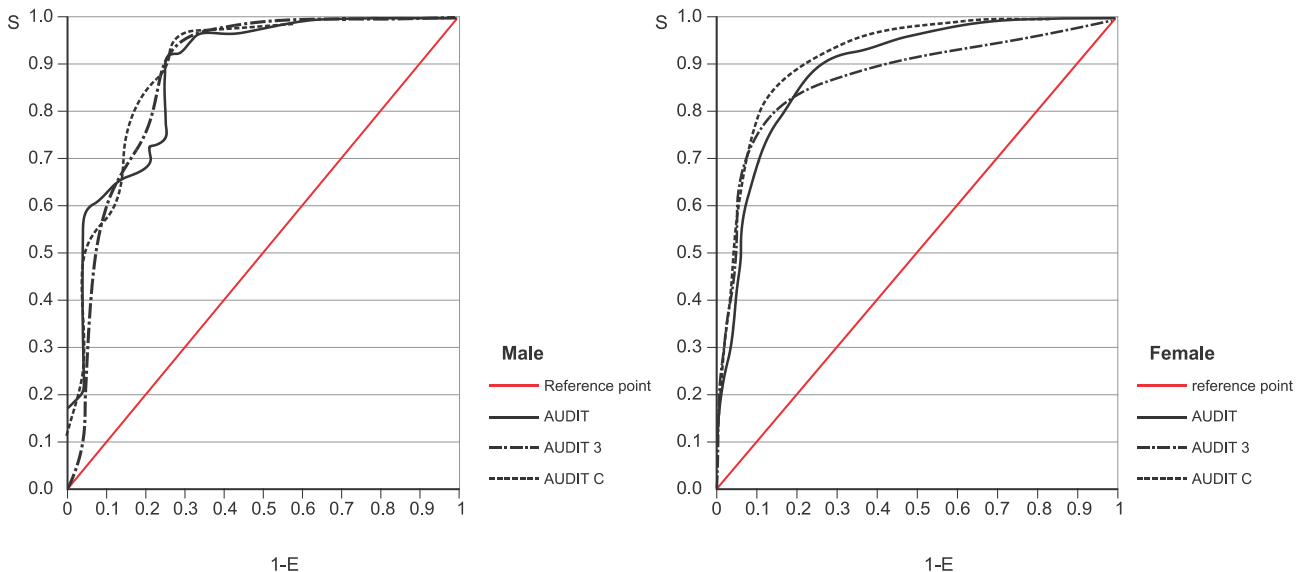
Table 2 - (continuation)

| Version | AUROC (CI95%) | | Cutoff Point | | Sensibility | | Specificity | | *RV+ | | *RV- | |
|---------|------------------------|------------------------|--------------|-----|-------------|--------|-------------|--------|-------|-------|-------|------|
| | #M | #F | #M | #F | #M | #F | #M | #F | #M | #F | #M | #F |
| | | | >4 | >4 | 0.00 | 0.00 | 100.00 | 100.00 | - | - | 1.00 | 1.00 |
| AUDIT-C | 0.892 (0.801-0.951) | 0.916 (0.869-0.950) | =0 | =0 | 100.00 | 100.00 | 0.00 | 0.00 | 1.00 | 1.00 | - | - |
| | | | >0 | >0 | 100.00 | 100.00 | 29.17 | 23.47 | 1.41 | 1.31 | 0.00 | 0.00 |
| | | | >1 | >1 | 98.15 | 98.15 | 45.83 | 54.08 | 1.81 | 2.14 | 0.04 | 0.03 |
| | | | >2 * | >2 | 96.30 | 91.67 | 70.83 | 75.51 | 3.30 | 3.74 | 0.052 | 0.11 |
| | | | >4 | >3* | 88.89 | 80.56 | 75.00 | 88.78 | 3.56 | 7.18 | 0.15 | 0.22 |
| | | | >5 | >4 | 79.63 | 57.41 | 83.33 | 94.90 | 4.78 | 11.25 | 0.24 | 0.45 |
| | | | >6 | >5 | 61.11 | 37.04 | 87.50 | 96.94 | 4.89 | 12.10 | 0.44 | 0.65 |
| | | | >7 | >6 | 50.00 | 25.00 | 95.83 | 98.98 | 12.00 | 24.50 | 0.52 | 0.76 |
| | | | >8 | >7 | 50.01 | 15.74 | 95.83 | 100.00 | 8.89 | - | 0.66 | 0.84 |
| | | | - | >8 | - | 7.41 | - | 100.00 | - | - | - | 0.93 |

*VR: verisimilitude ratio; #M: male, F: female

All of the AUDIT versions demonstrated adequate discriminatory power (AUROC > 0.80) for both genders. The cutoff point for the AUDIT questionnaire in the college students sample was lower than the WHO guidelines for adults (≥ 8).

Figure 2 shows the ROC curves constructed using the AUDIT questionnaire and its reduced versions for both males and females.



Males: $\Delta_{AUDIT \times AUDIT3} = 0,022$; $p = 0,422$; $\Delta_{AUDIT \times AUDITC} = 0,011$; $p = 0,494$; $\Delta_{AUDIT3 \times AUDITC} = 0,033$; $p = 0,189$
 Females: $\Delta_{AUDIT \times AUDIT3} = 0,048$; $p = 0,050$; $\Delta_{AUDIT \times AUDITC} = 0,021$; $p = 0,221$; $\Delta_{AUDIT3 \times AUDITC} = 0,068$; $p < 0,00$

Figure 2 - AUDIT, AUDIT-3 and AUDIT-C ROC curves for detecting binge drinking in male and female dentistry students. Araraquara, 2011

The discriminating capacity of the three methods was similar for detecting binge drinking among male students. There was a statistically significant variance ($p < 0.001$) between the AUDIT-3 and AUDIT-C, with the latter showing better discriminatory power (AUROC = 0.91).

Discussion

Excessive consumption of alcohol at an early age, in addition to the physical, psychological and social damages

resulting from this type of behavior, is considered as a pressing public health problem⁽¹⁹⁾. Therefore, the investigation of drinking behaviors among college students and the early detection of the excessive drinking patterns are important steps toward the implementation of effective treatments, preventive measures, and effective awareness.

Worldwide researchers have⁽³⁻⁴⁾ identified a high prevalence of alcohol use among college students, and have emphasized the need for studies to identify risk and binge drinking patterns within this group.

It may be noted, in this study, that almost all of the students reported consuming alcoholic beverages (Figure 2). The magnitude of these results is alarming because it demonstrates a higher prevalence among the Dentistry students when compared to other groups⁽³⁻⁴⁾. One can speculate that the high prevalence of alcohol use is a coping mechanism employed by the students when dealing with academic challenges such as the high hourly load of the dentistry course, the large number of evaluations, and the requirements of autonomy and responsibility imposed on the student. This phase is marked by the discovery of feelings of power and freedom, and in that context, the intake of alcohol can act as a support in coping with adverse situations or circumstances present in this phase of maturation⁽²⁰⁾.

The high prevalence of the binge drinking behavior among college students may reflect the social status of students who gather around for short duration parties with easy access to large quantities of alcoholic beverages. Equally worrisome is the possible prevalence of alcohol dependence (Table 1), detected especially among male students, signaling that alcohol consumption behavior adopted by the students is already resulting in serious physical, psychological and social consequences.

Even though with scientific proof that risk and binge drinking considerably increase the chances of developing problems, some authors warn that many of the alcohol harmful effects can also affect the individuals classified as moderate drinkers⁽²¹⁾.

There was no distinction between drinking habit and binge drinking behavior between men and women. Which may be associated with the changes in behavioral standards occurring in modern society where women have achieved more space, and their actions are equivalent to those performed by men; both with regard to work and personal activities. Therefore, women feel motivated to follow the male drinking habits⁽²²⁾.

Regarding the effectiveness of the methodology to detect binge drinking; both the complete and the reduced forms of the test demonstrated adequate discriminatory capability (Table 2 and Figure 2) which agrees with previous studies^(15,23-24). Despite the good discriminatory ability of the three methods, with regard to the females, the AUDIT-C present significantly higher ability than the AUDIT-3; therefore, it should be the reduced version of choice.

In the choice of tools, there is a need to investigate the pattern of diagnosis to be carried out, since the full AUDIT offers a better characterization of the drinking behavior in relation to the reduced versions⁽²³⁾. This aspect is of great importance, which leads us to suggest that the reduced versions can be interesting when conducting large epidemiological studies whose only goal is to detect the type of drinking behavior. Moreover, as already noted in the literature⁽²³⁾, if the study required further clarification for the evaluation of addiction, its symptoms, and damages in relation to the drinking habit; then, the full version should be used.

Regarding the suggested cutoff points for detection of binge drinking behavior, there is emphasizes in the importance of considering the characteristics of the study population and the method employed as the gold standard. In the literature, there is a lack of consensus regarding the definition of these cutoff points, both due to the peculiarities of each sample and the standard methodology. However, it becomes clear that the cutoff points to be adopted for adolescents and/or college students should be lower than those attributed to the adult population.

Conclusion

There was a high prevalence of alcohol consumption and binge drinking among dentistry students of both genders. Both the full AUDIT and its reduced forms (AUDIT-C and AUDIT-3) were effective in detecting binge drinking behavior. Despite the conclusions, this study has its limitations because the sample was restricted to Dentistry students. Thus, the conduction of similar studies involving other populations is advisable.

References

1. Pinsky I, Bessa MA. *Adolescência e Drogas*. São Paulo: Contexto; 2004.
2. Marçal CLA, Assis F, Lopes GT. O uso de bebidas alcoólicas pelos estudantes de enfermagem da Universidade do Estado do Rio de Janeiro (FENF/UERJ). *SMAD Rev Eletrônica Saúde Mental Álcool Drog. (Ed. port.)* [Internet]. 2005;1(2):1-16. Disponível em: http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S1806-69762005000200004&lng=pt&nrm=iso
3. Bulmer SM, Irfan S, Mugno R, Barton B, Ackerman L. Trends in Alcohol Consumption Among Undergraduate Students at a Northeastern Public University, 2002–2008. *J Am Coll Health*. 2010;58(4):383-90.
4. Wells GM. The effect of religiosity and campus alcohol culture on collegiate alcohol consumption. *J Am Coll Health*. 2010;47(6):247-52.
5. Shin SH, Edwards EM, Heeren T. Child abuse and neglect: Relations to adolescent binge drinking in the national longitudinal study of Adolescent Health (AddHealth) Study. *Addict Behav*. 2009;34(3):277-80.
6. Townshend JM, Duka T. Patterns of alcohol drinking in a population of young social drinkers: a comparison of questionnaire and diary measures. *Alcohol Alcohol*. 2002;37(2):187-92.
7. Saunders JB, Aasland OG, Babor TF, De La Fuente JR, Grant M. Development of the alcohol use disorders identification test (AUDIT): WHO collaborative project on early detection of persons with harmful alcohol consumption - II. *Addiction*. 1993;88(6):791-804.
8. Reinert D, Allen JP. The Alcohol Use Disorders Identification Test (AUDIT): A Review of Recent Research. *Alcohol Clin Exp Res*. 2002;26(2):272-9.
9. Babor TF, De La Fuente JR, Saunders J, Grant M. The alcohol use disorders identification test: guidelines for

- use in primary health care. World Health Organization, Division of Mental Health. 1989.
10. Schmidt A, Barry KL, Fleming MF. Detection of problem drinkers: The Alcohol Use Disorders Identification Test (AUDIT). *South Med J*. 1995;88(1):52-9.
 11. Bohn MJ, Babor TF, Kranzler HR. The Alcohol Use Disorders Identification Test (AUDIT): Validation of a screening instrument for use in medical settings. *J Stud Alcohol*. 1995;56(4):423-32.
 12. Tuunanen M, Aalto M, Seppä K. Binge drinking and its detection among middle-aged men using AUDIT, AUDIT-C and AUDIT-3. *Drug Alcohol Rev*. 2007;26(3):295-9.
 13. Gual A, Segura L, Contel M, Heather N, Colom J. Audit-3 and Audit-4: Effectiveness of two short forms of the alcohol use disorders identification test. *Alcohol Alcohol*. 2002;37(6):591-6.
 14. Gordon AJ, Maisto SA, McNeil M, Kraemer KL, Conigliaro RL, Kelley ME, et al. Three Questions Can Detect Hazardous Drinkers. *J Fam Pract*. 2001;50(4):313-20.
 15. Aalto M, Alho H, Halme JT, Seppä K. AUDIT and its abbreviated versions in detecting heavy and binge drinking in a general population survey. *Drug Alcohol Depend*. 2009;103(1-2):25-9.
 16. Babor TF, Higgins-Biddle JC, Saunders JB, Monteiro MG. AUDIT - The alcohol use disorders identification test. Geneva: World Health Organization; 2001.
 17. Mendez EB. Uma versão Brasileira do AUDIT. Pelotas - RS: Universidade Federal de Pelotas; 1999.
 18. Goudriaan AE, Grekin ER, Sher KJ. Decision Making and Binge Drinking: a longitudinal study. *Alcohol Clin Exp Res*. 2007;31(6):928-38.
 19. Huurre T, Lintonen T, Kaprio J, Pelkonen M, Marttunen M, Aro H. Adolescent risk factors for excessive alcohol use at age 32 years. A 16-year prospective follow-up study. *Soc Psychiatry Psychiatr Epidemiol*. 2010;45(1):125-34.
 20. Balan TG, Campos CJG. Padrão de Consumo de Bebidas Alcoólicas entre Graduandas de Enfermagem de uma Universidade Estadual Paulista. *SMAD, Rev. Eletrônica Saúde Mental Álcool Drog. (Ed. port.)*. [Internet]. 2006, 2(2) [acesso 17 jun 2012]; Disponível em: http://pepsic.bvsalud.org/scielo.php?script=sci_arttext&pid=S1806-69762006000200003&lng=pt&nrm=iso
 21. Kraus L, Baumeister SE, Pabst A, Orth B. Association of Average Daily Alcohol Consumption, Binge Drinking and Alcohol-Related Social Problems: Results from the German Epidemiological Surveys of Substance Abuse. *Alcohol Alcohol*. 2009;44(3):314-20.
 22. Carpenter R, Fishlock A, Mulroy A, Oxley B, Russell K, Salter C, et al. After "Unit 1421": an exploratory study into female students' attitudes and behaviours towards binge drinking at Leeds University. *J Public Health*. 2008;30(1):8-13.
 23. Aalto M, Tuunanen M, Sillanaukee P, Seppä K. Effectiveness of Structured Questionnaires for Screening Heavy Drinking in Middle-Aged Women. *Alcohol Clin Exp Res*. 2006;30(11):1884-8.
 24. Meneses-Gaya C, Zuardi AW, Loureiro SR, Hallak JEC, Trzesniak C, Marques JMA, et al. Is the Full Version of the AUDIT Really Necessary? Study of the Validity and Internal Construct of Its Abbreviated Versions. *Alcohol Clin Exp Res*. 2010;34(8):1417-24.