

Reliability of a self-report Italian version of the AUDIT-C questionnaire, used to estimate alcohol consumption by pregnant women in an obstetric setting

Valutazione dell'affidabilità della versione italiana del questionario AUDIT-C per la rilevazione del consumo di alcol in gravidanza

STEFANIA BAZZO¹, GIUSEPPE BATTISTELLA², PATRIZIA RISCICA³, GIULIANA MOINO³, GIUSEPPE DAL POZZO⁴, MERY BOTTAREL⁴, MARIASOLE GEROMEL⁵, LOREDANA CZERWINSKY⁶
E-mail: stefania.bazzo@gmail.com

¹Doctoral school in Sciences of Reproduction and Development, University of Trieste, Italy

²Epidemiologic Unit, Local Health Authority of Treviso, Veneto Region, Italy

³Addiction Department, Local Health Authority of Treviso, Veneto Region, Italy

⁴Gynaecology and Obstetrics Unit, Local Health Authority of Treviso, Veneto Region, Italy

⁵University of Udine, Italy

⁶University of Trieste, Italy

SUMMARY. Aim. Alcohol consumption during pregnancy can result in a range of harmful effects on the developing foetus and newborn, called Fetal Alcohol Spectrum Disorders (FASD). The identification of pregnant women who use alcohol enables to provide information, support and treatment for women and the surveillance of their children. The AUDIT-C (the shortened consumption version of the Alcohol Use Disorders Identification Test) is used for investigating risky drinking with different populations, and has been applied to estimate alcohol use and risky drinking also in antenatal clinics. The aim of the study was to investigate the reliability of a self-report Italian version of the AUDIT-C questionnaire to detect alcohol consumption during pregnancy, regardless of its use as a screening tool. **Methods.** The questionnaire was filled in by two independent consecutive series of pregnant women at the 38th gestation week visit in the two birth locations of the Local Health Authority of Treviso (Italy), during the years 2010 and 2011 (n=220 and n=239). Reliability analysis was performed using internal consistency, item-total score correlations, and inter-item correlations. The “discriminatory power” of the test was also evaluated. **Results.** Overall, about one third of women recalled alcohol consumption at least once during the current pregnancy. The questionnaire had an internal consistency of 0.565 for the group of the year 2010, of 0.516 for the year 2011, and of 0.542 for the overall group. The highest item-total correlations’ coefficient was 0.687 and the highest inter-item correlations’ coefficient was 0.675. As for the discriminatory power of the questionnaire, the highest Ferguson’s delta coefficient was 0.623. **Conclusions.** These findings suggest that the Italian self-report version of the AUDIT-C possesses unsatisfactory reliability to estimate alcohol consumption during pregnancy when used as self-report questionnaire in an obstetric setting.

KEY WORDS: AUDIT-C, reliability, alcohol, pregnancy, consumption.

RIASSUNTO. Scopo. L’uso di alcol durante la gravidanza può avere effetti dannosi sullo sviluppo del feto e del neonato, denominati Fetal Alcohol Spectrum Disorders (FASD). L’identificazione delle donne consumatrici di bevande alcoliche in gravidanza permette di fornire loro corrette informazioni e supporto. Il questionario AUDIT-C è somministrato per identificare il consumo di alcol a rischio in diverse categorie di popolazione, ed è stato utilizzato anche per rilevare l’uso di alcol in fase prenatale. Lo scopo del presente studio è di misurare l’affidabilità della versione italiana autocompilata dell’AUDIT-C per stimare il consumo di alcol in gravidanza, a prescindere dal suo utilizzo come strumento di screening. **Metodi.** Il questionario AUDIT-C è stato compilato da due serie cliniche consecutive e indipendenti di donne che accedevano ai due ospedali dell’Azienda ULSS n. 9 di Treviso per il monitoraggio della 38esima settimana di gestazione, rispettivamente nel 2010 e nel 2011 (n=220 e n=239). L’affidabilità è stata valutata misurando la consistenza interna, le correlazioni tra i punteggi dei singoli item e il totale, e le correlazioni tra gli item. In aggiunta, è stato misurato anche il potere discriminante del questionario. **Risultati.** Circa un terzo delle donne che hanno compilato il questionario ha dichiarato di aver bevuto bevande alcoliche almeno una volta durante la gravidanza in corso. Il questionario ha un coefficiente di consistenza interna di 0,565 per il gruppo del 2010 e di 0,516 per quello del 2011 (0,542 per la totalità delle gestanti). Il più alto coefficiente di correlazione tra i punteggi dei singoli item e il totale è 0,687 e il più elevato coefficiente di correlazione tra gli item è 0,675. Per quanto riguarda il potere discriminante, il coefficiente più alto (Ferguson’s delta) è 0,623. **Conclusioni.** I risultati del presente studio suggeriscono che l’AUDIT-C, nella versione italiana e autocompilata, sembra dimostrare un’insufficiente affidabilità nel rilevare l’uso di alcol in gravidanza, se usato come questionario di rilevazione del consumo in un setting ostetrico.

PAROLE CHIAVE: AUDIT-C, affidabilità, alcol, gravidanza, consumo.

INTRODUZIONE

Prenatal exposure to ethanol can cause a range of harmful effects on the developing foetus and child, called Fetal Alcohol Spectrum Disorders (FASD)¹. The adverse consequences of exposure to alcohol in utero include a continuum of physical, neurocognitive, behavioral and emotional problems, that can emerge later in life and have lifelong implications².

The identification of women who consume alcoholic beverages during gestation may contribute to reducing alcohol-exposed pregnancies and thus the burden of FASD^{3,4}. The recognition of women who drink alcohol and the cessation of alcohol use are most beneficial during the pre-conception period and in early pregnancy⁵⁻⁸. Detection of alcohol exposure later in gestation may also contribute to ameliorating some of the maternal complications and neonatal outcomes as well as allowing timely treatment and support to the woman and the baby⁹⁻¹¹.

Detecting alcohol use in pregnancy allows the provision of information, support and treatment for women and the surveillance of the newborn. Such care can include brief interventions targeted to moderate drinkers, a multidisciplinary and comprehensive assessment of pregnant women who abuse alcohol, the monitoring of maternal and fetal status, providing information to the paediatrician for a possible evaluation for FASD, and monitoring and support of breastfeeding in women who continue to consume alcohol after delivery¹²⁻¹⁷.

The incorporation of screening tools into routine antenatal assessment could help to increase the detection rate of women using alcohol and could lead to undertaking a fuller assessment of alcohol intake and appropriate referrals¹⁷⁻²⁰. To detect risky drinking and alcohol dependence during pregnancy various screening instruments are used^{21,22}: two of them, T-ACE and TWEAK are specific for pregnant women, while others were developed for use in the general population²³.

Another commonly used screening tool is the Alcohol Use Disorders Identification Test (AUDIT). This test is a 10-question test developed by the World Health Organization to screen for hazardous and harmful drinking in the general population. It can help practitioners identify people who could benefit from reducing or ceasing drinking^{24,25}. The AUDIT and its shortened consumption version (AUDIT-C) are utilised for investigating risky drinking or alcohol dependence with different populations²⁶⁻³². The AUDIT-C consists of the three consumption questions from AUDIT, which investigate the frequency of alcohol use, the amount of alcohol consumed on average and the frequency of consumption of large amounts of alcohol during a short period of time (usually four to six alcohol units, depending on the population of study).

The AUDIT-C is scored on a scale of 0-12 points. Each AUDIT-C question has a choice of five possible answers, ranging from 0 points to 4 points. Different cut-offs were established in different countries: in Italy, total scores equal to or greater than 5 for men and 4 for women indicate a possible hazardous consumption of alcohol³³.

Although the AUDIT-C was not designed specifically for use during pregnancy, it has also been applied in antenatal settings and has been utilized to investigate alcohol consumption by pregnant women, regardless of its use as a screening tool³⁴⁻³⁹. However, the reliability of use of the AUDIT-C as a questionnaire to assess alcohol use during pregnancy, has not been established⁴⁰⁻⁴⁴.

The aim of the present study was to establish the reliability of an Italian version of the AUDIT-C questionnaire, for estimating self-reported alcohol consumption in surveys administered to women at the end of pregnancy in an obstetric setting.

MATERIALS AND METHODS

A self-report version of the AUDIT-C test was filled in by all women in the final stages of pregnancy who had access to the two birth locations of the Gynaecology and Obstetrics Department of the Local Health Authority no. 9 of Treviso, Italy, for the 38th gestation week visit in two different periods of time. The first consecutive series of women had the visit in a continuous 30-day period between 07 April and 07 May 2010 (n=220). The second had the visit in a continuous 30-day period one year later, between 27 April and 27 May 2011 (n=239). Almost all women who will deliver in these birth clinics have a free obstetric visit in the hospital setting at the 38th week of pregnancy. The exclusion criterion was the insufficient knowledge of Italian language.

In addition, information among socio-demographic characteristics was gathered, again by a self-report questionnaire.

We used the Italian version of the short Alcohol Use Disorder Identification Test (AUDIT-C)⁴⁵ adapted for pregnant women: the second item of the test, which investigated the average number of drinks consumed per drinking day, was modified by introducing a five-point scale including the following options: "0 standard glasses" (0 points), "1 or 2 glasses" (1 point), "3 or 4 glasses" (2 points), "5 or 6 glasses" (3 points) and "7 or more glasses" (4 points). A standard glass was defined as a glass of wine, a small beer, an aperitif, or a small glass of high-alcoholic drink. The frequency of consumption of large amounts of alcohol during a short period of time was measured as the consumption of six glasses on one occasion. We asked the women to give answers relating to the whole period of pregnancy.

Statistical analysis

Statistical analysis was performed with SPSS 13 and WinPEPI 10. Only women who filled in the whole AUDIT-C questionnaire were included in the analysis. The statistical analysis was performed both on each group and on the overall data set.

First, the descriptive statistical analysis was carried out.

To determine whether the two groups were similar, different evaluations were performed on socio-demographic variables. Independent group t-tests were performed to determine whether there were significant differences between the means of variables. For quantitative non-homoscedastic variables, the Wilcoxon test was applied. For qualitative variables, chi square tests were performed to detect differences between distributions. A p-value of <0.05 was chosen as the significance level.

Reliability analysis was performed using internal consistency, item-total score correlations, and inter-item correlations. Internal consistency was measured using Cronbach's alpha statistic, item-total score correlations and inter-item correlation were evaluated using Pearson's correlation coefficient. The reliability analysis was carried out both on each group and on the overall data set.

The discriminatory power of the test, defined as the ability to produce a spread of scores, was also evaluated. Discriminatory power was measured by Ferguson's delta. The Ferguson's delta was calculated considering all items, deleting each item in turn and for each specific item. Test-retest reliability was also calculated to assess the consistency of the measure at population level⁴⁶. The test-retest reliability was estimated by calculating the Pearson's correlation coefficients.

Reliability of a self-report Italian version of the AUDIT-C questionnaire

RESULTS

Characteristics of participants

Overall, 482 women completed the questionnaire. Twenty-three women were excluded: seventeen because they did not fill in the whole AUDIT-C, and six because they had an insufficient knowledge of Italian language. No refusals were recorded. The mean age of those who participated in the first data collection was 33.05 years (SD: 5.10), and the second 33.68 (SD: 5.13). There was no significant difference in age (p=0.193). Nationality and educational qualification are reported in Table 1. No significant differences between the two groups were found.

Reported alcohol use

Declared alcohol use is reported in Table 2. Overall, about one third of women recalled alcohol consumption at least once during the current pregnancy. Eleven percent declared alcohol use more than once a month. Two percent recalled an occasional consumption of six or more drinks during a short period of time.

Individual level analysis

The questionnaire had an internal consistency of 0.565 for the group of the year 2010 and of 0.516 for the year 2011. The Cronbach's alpha coefficient of all the data set was 0.542. These coefficients showed a poor internal consistency^{47,48}. Item-total and inter-item correlation coefficients are reported in Tables 3 and 4.

Characteristics		2010	2011	Overall	P
		N (%)	N (%)	N (%)	
Nationality	Italian	183 (83.2)	209 (87.4)	392 (85.4)	0.246
	Foreign	37 (16.8)	30 (12.6)	67 (14.6)	
	Total	220 (100)	239 (100)	459 (100)	
Educational qualification	No educational qualification	6 (2.7)	5 (2.1)	11 (2.4)	0.162
	Elementary or middle school education	31 (14.2)	33 (13.8)	64 (14.0)	
	Three-year or professional high school diploma	39 (17.8)	29 (12.1)	68 (14.8)	
	Five-year high school diploma or equivalent from abroad	87 (39.7)	97 (40.6)	184 (40.2)	
	University degree	56 (25.6)	75 (31.4)	131 (28.6)	
Total		219 (100)	239 (100)	458 (100)	

Variables		2010	2011	Overall
		N (%)	N (%)	N (%)
Frequency of alcohol use (AUDIT-C item 1)	Never (0) ^a	149 (67.7)	166 (69.5)	315 (68.6)
	Less than or once a month (1)	43 (19.6)	49 (20.5)	92 (20.1)
	2-4 times a month (2)	24 (10.9)	21 (8.8)	45 (9.8)
	2-3 times a week (3)	4 (1.8)	2 (0.8)	6 (1.3)
	4 or more times a week (4)	0 (0)	1 (0.4)	1 (0.2)
	Total		220 (100)	239 (100)
Quantities consumed on average (AUDIT-C item 2)	0 glasses (0)	178 (80.9)	202 (84.5)	380 (82.8)
	1 or 2 glasses (1)	42 (19.1)	35 (14.7)	77 (16.8)
	3 or 4 glasses (2)	0 (0)	2 (0.8)	2 (0.4)
	Total		220 (100)	239 (100)
Frequency of consumption of six or more glass of alcoholic drinks per occasion (AUDIT-C item 3)	Never (0)	214 (97.3)	235 (98.3)	449 (97.8)
	Less than or once a month (1)	6 (2.7)	4 (1.7)	10 (2.2)
	Total		220 (100)	239 (100)
Total AUDIT-C score	0	146 (66.4)	162 (67.8)	308 (67.1)
	1	25 (11.4)	33 (13.8)	58 (12.6)
	2	26 (11.8)	27 (11.3)	53 (11.5)
	3	18 (8.2)	12 (5.0)	30 (6.5)
	4	5 (2.3)	4 (1.7)	9 (2.0)
	5	0 (0)	1 (0.4)	1 (0.2)
	Total		220 (100)	239 (100)

^aAUDIT-C scores

As for the discriminatory power of the questionnaire, it was calculated on the three items, deleting each item in turn and for each specific item; the highest Ferguson's delta coefficient was 0.623, lower than 0.9, the minimum level to consider items discriminating^{49,50}. All the values are reported in Table 5.

Population level analysis

Test-retest reliability analysis showed a high level of reliability of the questionnaire. The coefficients were: 0.999 for the first item

Table 3. Item-total correlations' coefficients

Variables	2010		2011		Overall	
	Coefficients	p	Coefficients	p	Coefficients	p
AUDIT-C item 1	0.626	0.000	0.544	0.000	0.586	0.000
AUDIT-C item 2	0.687	0.000	0.605	0.000	0.646	0.000
AUDIT-C item 3	0.158	0.019	0.119	0.066	0.646	0.002

Table 4. Inter-item correlations' coefficients

Variables	2010	2011	Overall
AUDIT-C item 1, AUDIT-C item 2	0.675	0.586	0.630
AUDIT-C item 1, AUDIT-C item 3	0.117	0.059	0.092
AUDIT-C item 2, AUDIT-C item 3	0.203	0.196	0.199
Mean inter-item correlation coefficient	0.332	0.280	0.307

Table 5. Ferguson's delta coefficients

Variables	2010			2011			Overall		
	Based on all 3 items	Deleting each item in turn	For specific items	Based on all 3 items	Deleting each item in turn	For specific items	Based on all 3 items	Deleting each item in turn	For specific items
AUDIT-C	0.561			0.540			0.550		
AUDIT-C item 1		0.359	0.392		0.305	0.332		0.332	0.362
AUDIT-C item 2		0.549	0.599		0.525	0.573		0.537	0.586
AUDIT-C item 3		0.571	0.623		0.546	0.595		0.558	0.609

($p=0.000$), 0.997 for the second ($p=0.047$), 1.000 for the third, 0.998 for the all-test ($p=0.000$).

DISCUSSION

The AUDIT and AUDIT-C questionnaires are used to measure alcohol consumption before and during gestation and the utilization of these tests in antenatal settings continues to be recommended in many countries, especially in routinely maternity care^{51,52}. A recent study performed in UK on a sample of women attending their first antenatal visit at about 10-11 weeks of gestation, suggested that AUDIT and AUDIT-C questionnaires help midwives to gather information about alcohol use among pregnant women and to offer appropriate advice⁵³. Another study, carried out in Ireland, used a questionnaire based on the AUDIT to determine the prevalence of alcohol consumption during gestation in general practice setting⁵⁴. However, we continue to have no information about the reliability of this questionnaire to measure alcohol consumption. In Italy, a country where alcohol is a socially accepted and widespread substance, investigating alcohol use during the prenatal period is extremely important⁵⁵. Results of our study showed that the Italian version of the questionnaire, administered to pregnant women at the final stages of gestation, revealed an unsatisfactory degree of internal consistency of the items of AUDIT-C, with a Cronbach's alpha coefficient of 0.542 for the entire data set. We also found low inter-

item and item-total correlations. As for the discriminatory power of the questionnaire, the items cannot be considered sufficiently discriminating.

At a population level, we found high test-retest reliability coefficients. This result is consistent with those of another study that revealed high test-retest reliability of the full AUDIT in a general population group⁵⁶. These findings suggested that, although the measures were stable over time at the population level, the properties of the questionnaire as a self-report instrument to estimate individual alcohol use were unsatisfactory.

The study had some limitations: firstly, the fact that alcohol consumption was estimated based on the whole period of pregnancy and not on a restricted period of time (e.g., the last month) may lead to the underestimation of alcohol consumption, which is a widely recognized problem when detecting alcohol use habits^{57,58}. Secondly, as for the third item of the questionnaire, we asked participants to report the frequency of consumption of six or more alcohol units in a short period of time, while some versions asked for use of four or more alcoholic drinks on one occasion⁵⁹.

CONCLUSIONS

The self-report modified Italian version of the AUDIT-C questionnaire showed unsatisfactory reliability when used to estimate alcohol consumption during pregnancy among women in an obstetric

Reliability of a self-report Italian version of the AUDIT-C questionnaire

setting. A simple and short reliable questionnaire to estimate alcohol consumption in antenatal settings is needed, in order to help health-care professionals to provide women with appropriate information and support.

REFERENCES

1. Hoyme HE, May PA, Kalberg WO, et al. A practical clinical approach to diagnosis of fetal alcohol spectrum disorders: clarification of the 1996 institute of medicine criteria. *Pediatrics* 2005; 115: 39-47.
2. Coriale G, Fiorentino D, Di Lauro F, et al. Fetal Alcohol Spectrum Disorder (FASD): neurobehavioral profile, indications for diagnosis and treatment. *Riv Psichiatr* 2013; 48: 359-69.
3. Elliott L, Coleman K, Suebwongpat A, Norris S. Fetal Alcohol Spectrum Disorders (FASD): systematic reviews of prevention, diagnosis and management. HSAC Report 2008, 1(9). Retrieved from: http://www.healthsac.net/downloads/publications/HSAC07_FASD_FINALv3.pdf
4. Centers for Disease Control and Prevention (CDC). Alcohol use among pregnant and nonpregnant women of childbearing age - United States, 1991-2005. *MMWR Morb Mortal Wkly Rep* 2009; 58: 529-32.
5. Floyd RL, Decouflé P, Hungerford DW. Alcohol use prior to pregnancy recognition. *Am J Prev Med* 1999; 17: 101-07.
6. Chang G. Screening and brief intervention in prenatal care settings. *Alcohol Res Health* 2004-2005; 28: 80-4.
7. Mengel MB, Searight HR, Cook K. Preventing alcohol-exposed pregnancies. *J Am Board Fam Med* 2006; 19: 494-505.
8. Floyd RL, Weber MK, Denny C, O'Connor MJ. Prevention of fetal alcohol spectrum disorders. *Dev Disabil Res Rev* 2009; 15: 193-99.
9. Rosett HL, Weiner L, Zuckerman B, McKinlay S, Edelin KC. Reduction of alcohol consumption during pregnancy with benefits to the newborn. *Alcohol Clin Exp Res* 1980; 4: 178-84.
10. Coles CD, Smith I, Fernhoff PM, Falek A. Neonatal neurobehavioral characteristics as correlates of maternal alcohol use during gestation. *Alcohol Clin Exp Res* 1985; 9: 454-60.
11. Jacobson SW. Assessing the impact of maternal drinking during and after pregnancy. *Alcohol Health Res World* 1997; 21: 199-203.
12. Morse B, Gehshan S, Hutchins E. Screening for substance abuse during pregnancy: improving care, improving health. National Center for Education in Maternal and Child Health. Arlington, VA. 1997. Retrieved from: <http://www.ncemch.org/pubs/PDFs/SubAbuse.pdf>
13. Armstrong MA, Gonzales Osejo V, Lieberman L, Carpenter DM, Pantoja PM, Escobar GJ. Perinatal substance abuse intervention in obstetric clinics decreases adverse neonatal outcomes. *J Perinatol* 2003; 23: 3-9.
14. Chang G, McNamara TK, Orav EJ, et al. Brief intervention for prenatal alcohol use: a randomized trial. *Obstet Gynecol* 2005; 105: 991-98.
15. Floyd RL, O'Connor MJ, Bertrand J, Sokol R. Reducing adverse outcomes from prenatal alcohol exposure: a clinical plan of action. *Alcohol Clin Exp Res* 2006; 30: 1271-5.
16. American College of Obstetricians and Gynecologists. ACOG Committee Opinion No. 422: at-risk drinking and illicit drug use: ethical issues in obstetric and gynecologic practice. *Obstet Gynecol* 2008; 112: 1449-60.
17. American College of Obstetricians and Gynecologists. Committee on Health Care for Underserved Women. Committee opinion no. 496: at-risk drinking and alcohol dependence: obstetric and gynecologic implications. *Obstet Gynecol* 2011; 118: 383-8.
18. Bertrand J, Floyd RL, Weber MK, et al. National Task Force on FAS/FAE. Fetal Alcohol Syndrome: Guidelines for Referral and Diagnosis. Atlanta, GA: Centers for Disease Control and Prevention. 2004. Retrieved from: http://www.cdc.gov/ncbddd/fasd/documents/FAS_guidelines_accessible.pdf
19. NSW Department of Health. National clinical guidelines for the management of drug use during pregnancy, birth and the early development years of the newborn. 2006. Retrieved from: http://www.health.nsw.gov.au/pubs/2006/pdf/ngc_druguse.pdf
20. BMA Board of Science. Fetal alcohol spectrum disorders: a guide for healthcare professionals. 2007. Retrieved from: [http://www.bma.org.uk/ap.nsf/AttachmentsByTitle/PDFFetalalcohol/\\$FILE/FetalAlcoholSpectrumDisorders.pdf](http://www.bma.org.uk/ap.nsf/AttachmentsByTitle/PDFFetalalcohol/$FILE/FetalAlcoholSpectrumDisorders.pdf)
21. Russell M, Martier SS, Sokol RJ, et al. Screening for pregnancy risk-drinking. *Alcohol Clin Exp Res* 1994; 18: 1156-61.
22. Chang G. Alcohol-screening instruments for pregnant women. *Alcohol Res Health* 2001; 25: 204-9.
23. Sarkar M, Einaron T, Koren G. Comparing the effectiveness of TWEAK and T-ACE in determining problem drinkers in pregnancy. *Alcohol Alcohol* 2010; 45: 356-60.
24. 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: 791-804.
25. Babor TF, Higgins-Biddle JC, Saunders JB, Monteiro MG. The Alcohol Use Disorders Identification Test. Guidelines for use in primary care. 2nd ed. Geneva: WHO, 2001. Retrieved from: http://whqlibdoc.who.int/hq/2001/WHO_MSD_MSB_01.6a.pdf
26. Bush K, Kivlahan DR, McDonell MB, Fihn SD, Bradley KA. The AUDIT alcohol consumption questions (AUDIT-C): an effective brief screening test for problem drinking. Ambulatory Care Quality Improvement Project (ACQUIP). Alcohol Use Disorders Identification Test. *Arch Intern Med* 1998; 158: 1789-95.
27. Rumpf HJ, Hapke U, Meyer C, John U. Screening for alcohol use disorders and at-risk drinking in the general population: psychometric performance of three questionnaires. *Alcohol Alcohol* 2002; 37: 261-8.
28. Dawson DA, Grant BF, Stinson FS, Zhou Y. Effectiveness of the derived Alcohol Use Disorders Identification Test (AUDIT-C) in screening for alcohol use disorders and risk drinking in the US general population. *Alcohol Clin Exp Res* 2005; 29: 844-54.
29. Gache P, Michaud P, Landry U, et al. The Alcohol Use Disorders Identification Test (AUDIT) as a screening tool for excessive drinking in primary care: reliability and validity of a French version. *Alcohol Clin Exp Res* 2005; 29: 2001-7.
30. Dybek I, Bischof G, Grothues J, et al. The reliability and validity of the Alcohol Use Disorders Identification Test (AUDIT) in a German general practice population group. *J Stud Alcohol* 2006; 67: 473-81.
31. Bradley KA, DeBenedetti AF, Volk RJ, Williams EC, Frank D, Kivlahan DR. AUDIT-C as a brief screen for alcohol misuse in primary care. *Alcohol Clin Exp Res* 2007; 31: 1208-17.
32. Reinert DF, Allen JP. The alcohol use disorders identification test: an update of research findings. *Alcohol Clin Exp Res* 2007; 31: 185-99.
33. Istituto Superiore di Sanità (ISS). AUDIT-C Alcohol Use Disorders Identification Test. 2010. Retrieved from: www.epicentro.iss.it/alcol/apd2010/Allegati/scheda_audit.pdf
34. Chang G, Wilkins-Haug L, Berman S, Goetz MA, Behr H, Hiley A. Alcohol use and pregnancy: improving identification. *Obstet Gynecol* 1998; 91: 892-8.

35. The Scottish Intercollegiate Guidelines Network (SIGN). The management of harmful drinking and alcohol dependence in primary care. 2003. Retrieved from: <http://www.sign.ac.uk/pdf/sign74.pdf>
36. Burns E, Gray R, Smith LA. Brief screening questionnaires to identify problem drinking during pregnancy: a systematic review. *Addiction* 2010; 105: 601-14.
37. De Souza LH, Dos Santos MC, de Oliveira LC. [Alcohol use pattern in pregnant women cared for in a public university hospital and associated risk factors]. *Rev Bras Ginecol Obstet* 2012; 34: 296-303.
38. Vythilingum B, Roos A, Faure SC, Geerts L, Stein DJ. Risk factors for substance use in pregnant women in South Africa. *S Afr Med J* 2012; 102 (11 Pt 1): 851-4.
39. Wilson GB, McGovern R, Antony G, et al. Brief intervention to reduce risky drinking in pregnancy: study protocol for a randomized controlled trial. *Trials* 2012; 13: 174.
40. Göransson M, Magnusson A, Bergman H, Rydberg U, Heilig M. Fetus at risk: prevalence of alcohol consumption during pregnancy estimated with a simple screening method in Swedish antenatal clinics. *Addiction* 2003; 98: 1513-20.
41. Lemola S, Grob A. Drinking and smoking in pregnancy: what questions do Swiss physicians ask? *Swiss Med Wkly* 2007; 137: 66-9.
42. Lee SH, Shin SJ, Won SD, Kim EJ, Oh DY. Alcohol use during pregnancy and related risk factors in Korea. *Psychiatry Investig* 2010; 7: 86-92.
43. O'Connor MJ, Tomlinson M, Leroux IM, Stewart J, Greco E, Rotheram-Borus MJ. Predictors of alcohol use prior to pregnancy recognition among township women in Cape Town, South Africa. *Soc Sci Med* 2011; 72: 83-90.
44. Comasco E, Hallberg G, Helander A, Orelund L, Sundelin-Wahlsten V. Alcohol consumption among pregnant women in a Swedish sample and its effects on the newborn outcomes. *Alcohol Clin Exp Res* 2012; 36: 1779-86.
45. Struzzo P, De Faccio S, Moscatelli E, Scafato E. [Early detection of subjects at risk of alcohol abuse in a setting of primary health care in Italy: adaptation of a shorter version of the AUDIT Questionnaire and evaluation of its efficacy in the Italian context]. *Bollettino per le farmacodipendenze e l'alcolismo* 2006; 29: 20-5.
46. Kirshner B, Guyatt G. A methodological framework for assessing health indices. *J Chronic Dis* 1985; 38: 27-36.
47. Nunnally JC. *Psychometric theory*. 2nd ed. New York: McGraw Hill, 1978.
48. George D, Mallery P. *SPSS for Windows step by step: a simple guide and reference*. 11.0 update. 4th ed. Boston: Allyn & Bacon, 2003.
49. Ferguson GA. On the theory of test discrimination. *Psychometrika* 1949; 14: 61-8.
50. Kline P. *A handbook of test construction: introduction to psychometric design*. New York: Methuen, 1986.
51. Schluter PJ, Tautolo el-S, Taylor S, Paterson J. Alcohol consumption by parents of Pacific families residing in New Zealand: findings from the Pacific Islands Families Study. *Alcohol* 2013; 47: 241-8.
52. Payne JM, Watkins RE, Jones HM, et al. Midwives' knowledge, attitudes and practice about alcohol exposure and the risk of fetal alcohol spectrum disorder. *BMC Pregnancy Childbirth* 2014; 14: 377.
53. Smith L, Savory J, Couves J, Burns E. Alcohol consumption during pregnancy: cross-sectional survey. *Midwifery* 2014; 30: 1173-8.
54. Ní Shúilleabháin A, Barry J, Kelly A, O'Kelly F, Darker C, O'Dowd T. Alcohol consumption in pregnancy: results from the general practice setting. *Ir J Med Sci* 2014; 183: 231-40.
55. Fiorentino D, Coriale G, Spagnolo PA, et al. Fetal alcohol syndrome disorders: experience on the field. The Lazio study preliminary report. *Ann Ist Super Sanita* 2006; 42: 53-7.
56. Selin KH. Test-retest reliability of the alcohol use disorder identification test in a general population group. *Alcohol Clin Exp Res* 2003; 27: 1428-35.
57. Ernhart CB, Morrow-Tlucak M, Sokol RJ, Martier S. Underreporting of alcohol use in pregnancy. *Alcohol Clin Exp Res* 1988; 12: 506-11.
58. Witbrodt J, Kaskutas LA, Korcha R, Armstrong MA. Underestimation of alcohol consumption among women at-risk for drinking during pregnancy. *Contemp Drug Probl* 2008; 35: 37-58.
59. Bradley KA, Bush KR, Epler AJ, et al. Two brief alcohol-screening tests from the Alcohol Use Disorders Identification Test (AUDIT): validation in a female veterans affairs patient population. *Arch Intern Med* 2003; 163: 821-9.