

# 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*

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**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 38<sup>th</sup> 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)<sup>1</sup>. 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 implications<sup>2</sup>.

The identification of women who consume alcoholic beverages during gestation may contribute to reducing alcohol-exposed pregnancies and thus the burden of FASD<sup>3,4</sup>. The recognition of women who drink alcohol and the cessation of alcohol use are most beneficial during the pre-conception period and in early pregnancy<sup>5-8</sup>. 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 baby<sup>9-11</sup>.

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 delivery<sup>12-17</sup>.

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 referrals<sup>17-20</sup>. To detect risky drinking and alcohol dependence during pregnancy various screening instruments are used<sup>21,22</sup>: two of them, T-ACE and TWEAK are specific for pregnant women, while others were developed for use in the general population<sup>23</sup>.

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<sup>24,25</sup>. The AUDIT and its shortened consumption version (AUDIT-C) are utilised for investigating risky drinking or alcohol dependence with different populations<sup>26-32</sup>. 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 alcohol<sup>33</sup>.

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 tool<sup>34-39</sup>. However, the reliability of use of the AUDIT-C as a questionnaire to assess alcohol use during pregnancy, has not been established<sup>40-44</sup>.

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 38<sup>th</sup> 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 38<sup>th</sup> 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)<sup>45</sup> 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 level<sup>46</sup>. 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<sup>47,48</sup>. Item-total and inter-item correlation coefficients are reported in Tables 3 and 4.

Table 1. Characteristics of participants

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)	

Table 2. Reported alcohol use

Variables		2010	2011	Overall
		N (%)	N (%)	N (%)
Frequency of alcohol use (AUDIT-C item 1)	Never (0) <sup>a</sup>	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)	459 (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)	459 (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)	459 (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)	459 (100)

<sup>a</sup>AUDIT-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<sup>49,50</sup>. 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<sup>51,52</sup>. 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 advice<sup>53</sup>. 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 setting<sup>54</sup>. 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 important<sup>55</sup>. 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 group<sup>56</sup>. 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<sup>57,58</sup>. 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 occasion<sup>59</sup>.

## 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.

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