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# Alcohol consumption in pregnancy: performance of the Brazilian version of the questionnaire T-ACE

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## ABSTRACT

**OBJECTIVE:** To assess the performance characteristics of the Brazilian version of the Tolerance, Annoyed, Cut down and Eye-opener (T-ACE) questionnaire to screen alcohol consumption during pregnancy.

**METHODS:** Observational, cross-sectional study in a sequential sample of 450 women in the third trimester of pregnancy, attended in a maternity ward in a city of Southeastern Brazil, in 2001. The following instruments were used: a questionnaire to gather sociodemographic data, the T-ACE, a questionnaire to verify history of alcohol consumption throughout gestation, and a clinical interview to identify the harmful use of and dependence on alcohol, according to ICD-10 diagnostic criteria. Concordance tests among different interviewers as well as test-/re-test reliability tests were performed.

**RESULTS:** A total of 100 women (22.1%) were identified as positive by the T-ACE. The kappa indexes for concordance and reliability were 0.95, with 97% of concordant responses. When compared to the ICD-10 criteria and to the pattern of consumption, the T-ACE, with a cut-off point of two or higher, presented sensitivity and specificity coefficients of 100% and 85%, and of 97.9% and 86.6%, respectively.

**CONCLUSIONS:** The Brazilian version of the T-ACE seemed to appropriately meet the performance criteria that qualify it as a basic instrument for the screening of alcohol consumption during pregnancy. Its use in the routine and practice of obstetric services is recommended in view of the tendency for increased alcohol consumption among women, the difficulties to identify alcohol abuse by pregnant women, and the risk of developmental problems in children.

**KEY WORDS:** Alcohol drinking. Pregnant Women. Questionnaires. Translations. Reproducibility of results. Cross-sectional studies. Brazil.

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## INTRODUCTION

Alcohol consumption during pregnancy is a serious problem of public health<sup>5</sup> as it involves a great risk related to embriotoxicity and fetal teratogenicity.<sup>2,5,6,9,17</sup>

Pregnant women usually omit alcohol consumption during a medical consultation due to social stigma, related to the concept of immorality, aggressiveness and inadequate sexual behavior.<sup>5</sup> These women generally show guilt and shame, apart from the fear of losing the custody of their children.<sup>5</sup>

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Structured diagnostic interviews take plenty of time during pre-natal assistance or even during pre-delivery. Qualified professionals are needed to conduct them, besides the fact that they are not adequate to assess risky consumption. On the other hand, screening instruments are usually more sensitive and more easily applied in order to identify suspected cases.

Sokol et al<sup>15</sup> (1989) developed the T-ACE, which stands for *Tolerance, Annoyed, Cut down e Eye-opener*, a brief questionnaire similar to the CAGE (*Cut down, Annoyed, Guilt e Eye-opener*). The T-ACE, which can be applied in a two-minute conversation, was standardized for the routine and practice of gynecology and obstetrics services.<sup>15</sup> Besides enabling the detection of pregnant women who have a risky alcohol consumption in gynecological and obstetric services, this questionnaire turned out to be more efficient, with higher specificity (89%) and sensitivity (69%) than the CAGE and the MAST – Michigan Alcohol Screening Test.<sup>18</sup>

Recent publications have pointed out the alcohol consumption problem among Brazilian pregnant women, as well as the relation between alcohol consumption and psychiatric symptoms during pregnancy.<sup>13</sup> In Brazil, pre-natal assistance still lacks development of reliable routines and instruments that help healthcare professionals in actions of prevention and diagnosis of the problems related to alcohol consumption. An adequate assessment of alcohol consumption during pregnancy is an essential condition to prevent Fetal Alcohol Syndrome and the late effects of neurological development in children of pregnant women who have consumed alcohol.

The present study aimed at assessing the performance characteristics of the Brazilian version of the T-ACE, according to its validity, reliability, and concordance among different interviewers, and its adequacy for use in a sample of pregnant women, under the usual assistance conditions in an obstetric service of the *Sistema Único de Saúde* (National Healthcare System– SUS).

## METHODS

This was an observational, cross-sectional study on a convenience sample, recruited in a random, sequential fashion.<sup>13</sup> A total of 450 women participated in this study and they were all in their last trimester of pregnancy, under pre-natal care and not at risk. The data collection was carried out with women who used the prenatal care of the maternity hospital that attends pregnant women from the SUS in the city of Ribeirão Preto, in the state of São Paulo, in 2001. The maternity hospital requires pregnant women to have at least two pre-natal consultations, usually in the last trimester. This fact led to the data collection being limited to the third trimester, as it was more convenient to collect

during the prenatal consultation and the probability to reach a representative sample was higher.

The sample of participating pregnant women came from a population of low-risk pregnant women exclusively (without medical complications). In order to avoid biased sample selection, all pregnant women were directly approached by the researchers, in an independent manner, without previous knowledge of clinical history and without participation or influence from assisting professionals during the process of contact with these women.

The Kish method<sup>8</sup> (1965) was used to calculate the sample size, based on an estimated population of 3,000 pregnant women to be attended in 2001.<sup>5</sup> The calculation of sample size, using the approach suggested by Obuchowski<sup>12</sup> (1998), was made through the use of the Epidat software, provided by the Pan American Health Organization. The statistical power to analyze the sensitivity and specificity was verified in the sample analysis procedure for independent diagnostic tests. With a power of 75% and reliability level of 95%, prevalence value of 9% and sensitivity and specificity values between 70% and 95%, the ideal sample size would be 445 subjects (applying the Yates correction for chi-square). A total of 450 pregnant women were interviewed.

The data collection was carried out during the day, between 8am and 12pm, from Mondays through Fridays, and from March 12<sup>th</sup> to September 10<sup>th</sup> of 2001. The interviews and application of the T-ACE were conducted individually in two moments. Firstly, the pregnant women answered the T-ACE and the assessment of the alcohol consumption pattern, before and after the prenatal consultation, according to the operational viability provided by the service. The average time taken for the completion of the T-ACE was two minutes. After this, the pregnant woman was interviewed in an independent way by another interviewer, a doctor or nurse, properly trained to conduct the structured clinical interview with research diagnostic criteria from the International Classification of Diseases (ICD-10) in order to assess the diagnostic categories of alcohol harmful use and alcohol dependence syndrome.

To evaluate the concordance among interviewers, a sub-sample of 20% was formed and submitted to the application of the T-ACE by a second interviewer. The test was always carried out with the third pregnant woman of the day. The same sub-sample was re-evaluated by the same interviewer after a period of at least a week in order to verify the test/re-test reliability.

A structured interview to collect socio-demographic data, information on health condition and gestational development, and medical and family history was conducted. The medical history interview included a schedule for the assessment of the alcohol consump-

tion pattern, in terms of type of beverage, frequency and amount consumed, so as to establish the trimestral consumption pattern, considering four trimesters: the one that preceded the pregnancy and the three that the pregnancy is comprised of.

The T-ACE was translated into Portuguese from Sokol et al's original text<sup>16</sup> (1989), complemented by a careful review and submitted to back translation. The T-ACE questions were asked, alternated with other questions that deal with behavior related to diet habits and which do not interfere with the result of the instrument.

The four main questions that are part of the questionnaire aims: to gather information on tolerance (Tolerance – T); to investigate the existence of annoyance due to family and other people's criticisms as regards the pregnant woman's drinking habits (Annoyed – A); to assess the perception about the need to cut down on the consumption (Cut Down – C); and to get information about the persistence of consumption and dependence by means of a strong desire and compulsion to drink in the mornings (Eye-opener – E) (Table 1). Each of the four questions has a score that ranges from zero to two points for the first question, and from zero to one point from the second to the fourth questions.

The occasional consumption of 28 grams or more of absolute alcohol corresponds to the American pattern of two standard drinks, according to the National Institute on Alcoholism and Alcohol Abuse. This amount is used by Sokol et al<sup>16</sup> as a parameter of risk of development of problems related to the Fetal Alcohol Syndrome.

According to the criteria of operational validation of scales or diagnostic tests, systematic assessment of the T-ACE was carried out, comparing it to a gold standard, represented by the structured diagnostic clinical

interview for alcohol related problems, with research criteria from the ICD-10 (Harmful Use and Alcohol Dependence Syndrome). Thus, problems related to the use of alcohol (Harmful Use and Alcohol Dependence Syndrome) were investigated by means of an interview for clinical diagnosis, structured and standardized under the research criteria from the ICD-10.<sup>11</sup>

The following computer software for statistical analysis and data bank were used: MedCalc (for the analysis of the kappa coefficient correlation<sup>3</sup>) and Stata (for the analysis of intraclass correlation coefficients). The comparative analyses for the socio-demographic variables that are related to the pregnant woman's general health conditions were made by the application of univariated analyses and differences in proportion on contingency tables through the chi-square test.

This project was approved by the Research Ethics Committee of Hospital das Clínicas da Faculdade de Medicina de Ribeirão Preto.

## RESULTS

The majority of the pregnant women were between 20 and 29 years of age (61.6%), had elementary school level (46.0%), cohabiting (48.9%) or married (36.4%), and with a family income of up to five Brazilian monthly minimum wage (71.6%). A total of 42% of the pregnant women said they practice some type of religion; 67.6% were Catholic and 25.3% Protestants. The majority of the interviewed women were in their 36<sup>th</sup> to 39<sup>th</sup> week of pregnancy (77.1%) and 42% were first-time mothers.

The T-ACE pointed to the occurrence of 100 mothers (22.1%) who scored two or more points, suggesting that the occurrence of a risky consumption of alcohol during pregnancy, which constitutes the positive case group, is highly suspected. A total of 64 pregnant women out of the those 100 (14.2%) were positive with two points, constituting the largest group, identified as "positive case"; 23 cases (5.1%) had a positive result with three points; 11 women (2.4%) with four points and two women with five points. The group with a number of points lower than the cut-off point and considered to be a negative case for the screening of T-ACE was constituted by 256 women with zero points (56.9% of the sample) and 95 women with only one point (20.9%), totaling 350 pregnant women (77.8%) who are negative cases.

Table 2 shows the comparison of results of the application of the T-ACE by different evaluators in a subsample of 97 interviewees. The kappa index resulted in a concordance considered excellent ( $k=0.95$ ), with 97.9% of concordance. This table also shows the results of the comparison of application of the T-ACE in two

**Table 1.** Structure and scoring of the T-ACE questionnaire

T – How many drinks does it take to make you feel high? (Tolerance)
(assess according to the number of standard-drinks)
I don't drink – 0 points
Up to two drinks – 1 point
Three or more drinks – 2 points
A – Have people annoyed you by criticizing your drinking? (Annoyance)
No – 0 points
Yes – 1 point
C – Have you felt you ought to cut down on your drinking? (Cut down)
No – 0 points
Yes – 1 point
E – Have you ever had a drink first thing in the morning to steady your nerves or to get rid of a hangover? (Eye opener)
No – 0 points
Yes – 1 point

**Table 2.** Concordance among interviewers and test/re-test.

Concordance			
Interviewer	B Positive (N)	B Negative (N)	Total
A Positive (N)	32	2	34
A Negative (N)	0	63	63
Total	32	65	97
Re-test			
Interview	2 Positive (N)	2 Negative (N)	Total
1 Positive (N)	26	1	27
1 Negative (N)	1	69	70
Total	27	70	97

Concordance= 97.9%, kappa = 0.95 (EP=0.03; IC 95%: 0.89 – 1.0; Z=9.4; p<0.001).

Re-test= 97.9% - kappa = 0.95 (EP=0.03; IC 95%: 0.88 – 1.0; Z=9.3; p<0.001).

distinct interviews by the same interviewer (test/re-test), with an interval of one week between them, about the same sub-sample. The kappa index for the measure of test/re-test concordance was equally 0.95, classified as excellent, with a concordance in the re-application of the T-ACE in 97.9% of the cases.

On Table 3, 41 cases with a clinical diagnosis of problems related to the use of alcohol (27 cases of harmful use and 14 cases with dependence syndrome) are observed, according to the ICD-10 criteria, detected by the T-ACE (Chi-square: 157.9; p<0,001). The sensitivity value was 100.0% and the specificity one, 85.6%; the positive predictive value (PPV) was 41.0% and the negative predictive value (NPV) was 100.0%. These results point out that the T-ACE showed good performance as a screening instrument for the clinical

diagnoses of problems related to alcohol consumption, according to the criteria of the ICD-10 for the Harmful Use and Alcohol Dependence Syndrome.

Table 4 shows the variation in sensitivity and specificity of PPV and NPV, when the T-ACE values are compared to the pattern of alcohol consumption per trimester, since the three months prior to pregnancy. A variation in instrument sensitivity is observed throughout the gestational development: minor decrease from 83.6% to 78.9% in the three first months before pregnancy, increase to 90% in the second trimester, and to 97.9% in the third trimester.

## DISCUSSION

In the present study, the Brazilian version of the T-ACE reached a sensitivity of 78%, whereas Sokol et al<sup>16</sup> obtained a sensitivity of 69% in relation to the consumption pattern, two weeks before the application of the test, in the first trimester of pregnancy.

However, the fact that the T-ACE was applied in the last trimester of pregnancy in the present study and its results were compared to the consumption pattern throughout pregnancy is something that must be taken into consideration. When the test sensitivity is analyzed, comparing it to the consumption pattern in the third trimester of pregnancy, that is to say, at the moment of its application, the sensitivity reached 97.9%. One possible explanation can be attributed to the criterion used to assess the consumption pattern: whereas Sokol et al<sup>16</sup> used the average daily consumption, this study used the average consumption per occasion, criterion considered more sensitive than the original proposed by these authors.

**Table 3.** Comparison of T-ACE results with ICD-10 (gold standard).

T-ACE	ICD-10 Criteria (Harmful Use/Dependence)		
	Positive (N)	Negative (N)	Total
Positive	41	59	100
Negative	0	350	350
Total	41	409	450
Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
100.0%	85.6%	41.0%	100.0%
(IC 95%: 98.8 – 100)	(IC 95%: 82 – 89.1)	(IC 95%: 30.9 – 51.1)	(IC 95%: 99.9 – 100)

**Table 4.** T-ACE characteristics for alcohol consumption  $\geq$  28g per occasion.

Period	Sensitivity (%)	Specificity (%)	Positive Predictive Value (%)	Negative Predictive Value (%)
Pre-gestation trimester	83.6	97.6	92.0	94.9
1st trimester	78.9	97.0	90.0	95.1
2nd trimester	90.0	90.3	63.0	98.0
3rd trimester	97.9	86.6	46.0	99.7

In relation to specificity, the phenomenon is the opposite, a substantial decrease throughout pregnancy: from 97.6%, three months prior to pregnancy, to 86.6% in the third trimester. Sokol et al<sup>16</sup> found values of 89% for the third trimester of pregnancy.

There was no variation between the PPV of the first trimester and the PPV of the three months prior to pregnancy, as can be observed on Table 4. This indicates that women usually drink alcohol more frequently in the third trimester of pregnancy, a period during which it has not been diagnosed yet. The considerable decrease among the PPVs from the first to the third trimesters (90%, 63%, and 40%, respectively) may be explained by the reduction in alcohol consumption by part of the pregnant women, probably caused by the discovery of pregnancy.

The design of the study did not stray from the predominant model found in studies developed by original authors and followers,<sup>14,16</sup> who also based their work on results from hospital samples in their majority and with impoverished populations. Jacobson et al<sup>7</sup> (2002) concluded that the reports by pregnant women about levels of alcohol consumption were reliable, in a retrospective fashion. The consumption pattern reported by the pregnant woman and the clinical criteria for abuse or harmful use and dependence on alcohol, originating from ICD-10,<sup>11</sup> follows the example adopted by international studies regarding the use of diagnostic clinical instruments such as the gold standard to confront results from the T-ACE with a reference pattern.<sup>1,2</sup> The results obtained from the analysis of performance characteristics of the T-ACE were comparable to those found in similar studies.<sup>15</sup>

In the sample studied, the T-ACE found a rate of positive cases of 22.1%, similar to the 20.7% rate from

the city of Ribeirão Preto (Freire et al,<sup>4</sup> 2005) and the 24.1% rate from the city of Rio de Janeiro (Moraes et al,<sup>10</sup> 2005). The comparable rates found in these three studies enable to infer about the instrument validity as regards the stability of their results in different contexts of application. In the study by Pinheiro et al<sup>13</sup> (2005), conducted in the same sample of the present study, the relation among psychiatric symptoms, especially anxiety and depression, was evidenced as factors linked to the use of alcohol during pregnancy.

Finally, there is the need to adopt early screening instruments in the obstetric routine, taking into consideration the following: the current tendency of increased alcohol consumption by women of reproductive age; difficulties faced by obstetricians concerning the correct identification of alcohol use by the pregnant woman; and the high probability of child development problems among pregnant women who are at risk regarding alcohol consumption. For this purpose, the employment of the T-ACE showed satisfactory performance criteria, which qualify it as a basic instrument to screen risky alcohol consumption among pregnant women.

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