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Effectiveness of the CAGE questionnaire, gamma-glutamyltransferase and mean corpuscular volume of red blood cells as markers for alcohol-related problems in the workplace

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Abstract

Objective: To evaluate the usefulness of gamma-glutamyltransferase (GGT) and mean corpuscular volume (MCV), as well as that of the CAGE questionnaire, in workplace screening for alcohol abuse/dependence.
Methods: A total of 183 male employees were submitted to structured interviews (Structured Clinical Interview for DSM-IV 2.0 and CAGE questionnaire). Blood samples were collected. Diagnostic accuracy and odds ratio were determined for the CAGE, GGT and MCV.
Results: The CAGE questionnaire presented the best sensitivity for alcohol dependence (91%; specificity, 87.8%) and for alcohol abuse (87.5%, specificity, 80.9%), which increased when the questionnaire was used in combination with GGT (sensitivity, 100% and 87.5%, respectively; specificity, 68% and 61.5, respectively). CAGE positive results and/or alterations in GGT were less likely to occur among employees not presenting alcohol abuse/dependence than among those presenting such abuse (OR for CAGE = 13, $p < 0.05$; OR for CAGE-GGT = 11, $p < 0.05$) or dependence (OR for CAGE = 76, $p < 0.01$; OR for GGT = 5, $p < 0.01$). Employees not presenting alcohol abuse/dependence were also several times more likely to present negative CAGE or GGT results.
Conclusions: The use short, simple questionnaires, combined with that of low-cost biochemical markers, such as GGT, can serve as an initial screening for alcohol-related problems, especially for employees in hazardous occupations. The data provided can serve to corroborate clinical findings.

Keywords: Alcohol-related disorders; CAGE; Biological markers; Screening; Workplace

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1. Introduction

Alcohol abuse has been associated with low productivity, family distress and legal problems, all of which result in substantial costs to society (Harwood, 2000). According to the World Health Organization (WHO Report, 2002), alcohol consumption is the leading cause of increased numbers of disability adjusted life years (DALYs) in Brazil. In addition, as reported by the Social Welfare Administration (Odo et al., 2000), alcohol dependence is the third leading cause of overall absenteeism and the eighth leading cause of absenteeism due to illness.

To date, screening programs for alcohol-related problems in the workplace have been based on laboratory tests to detect alcohol consumption. However, these tests are not valid indicators of the social or behavioral problems caused by alcohol consumption (International Labour Office, 1996). Biological markers employed to indicate alcohol consumption have been included in mandatory periodic health checkups (Yano, Tagawa, Yamaoka, & Mori, 2001), fitness-for-job assessments (Arndt et al., 1998) and screening programs for alcohol-related problems. The major biological markers of alcohol consumption currently being used are gamma-glutamyltransferase (GGT), carbohydrate-deficient transferrin, and red blood cell volume, referred to as mean corpuscular volume (MCV) (Burge & Schneider, 1999; Litten & Allen, 1998; Sillanaukee, 1996). These two biological markers (GGT and MCV) are the only ones that are widely used (Bataille et al., 2003).

According to Aalto and Seppä (2005), 98% of primary care physicians in Finland (2.5% of them working in the field of occupational health care) reported using laboratory markers of alcohol consumption, such as GGT and MCV, for screening purposes. In the United States, Miller, Ornstein, Nietert, and Anton (2004) found that, in screening for alcohol abuse, MCV and GGT are used by, respectively, 54.2% and 35% of Practice Partner Research Network physicians. The authors also found that reluctance to order such tests was related to unfamiliarity with their use and interpretation.

Various studies have assessed the diagnostic accuracy of biochemical markers in determining the level and frequency of alcohol consumption (Anton, Lieber, & Tabakoff, 2002; Bataille et al., 2003; Glasinovic et al., 2001). Structured questionnaires such as the alcohol use disorders identification test (Hermansson, Knutsson, & Brandt, 2003) and CAGE questionnaire (Aertgeerts, Buntinx, Ansoms, & Fevery, 2001; Reynaud et al., 2000), as well as the criteria for alcohol abuse established in the DSM-III-R (Mundle, Ackermann, Munkes, Steinle, & Mann, 1999), and DSM-IV (Reynaud et al., 2000), have been also used.

In an analysis of six different clinical studies involving male subjects, Sillanaukee and Olsson (2001) observed that GGT presented a sensitivity of 59% and a specificity of 91% for identifying alcohol abuse. In another study (Reynaud et al., 2000), the sensitivity of MCV in the general population was found to be 24% for alcohol abuse and 63% for alcohol dependence, with a positive predictive value (PPV) of 83% and 93%, respectively. The authors found that the specificity of MCV for both conditions was 96%.

The performance of the CAGE questionnaire in screening patients with current alcohol abuse/dependence has been found to present a sensitivity of 21–94%, with a specificity of 77–97% (Aertgeerts et al., 2001; Fiellin, Reid, & O'Connor, 2000). In primary care settings or in the general population, the sensitivity of the CAGE questionnaire for dependence has been shown to be 82% and 75%, respectively, with a specificity greater than 90% (Cherpitel, 1998).

The debate surrounding the issue of whether biological markers are the most appropriate method of screening for alcohol abuse, achieving confirmation of suspicion of such abuse, monitoring abstinence and detecting relapses has yet to be resolved (Harasymiw & Bean, 2001). However, few studies have evaluated the diagnostic accuracy of using these tests in the workplace according to the diagnostic criteria for alcohol abuse/dependence.