



Investigation of  
**HAZARDOUS  
DRINKING**

### Key concepts:

- Approximately 20–25% of New Zealanders consume alcohol at a harmful or hazardous level
- In approximately three-quarters of patients presenting to general practice with alcohol related problems, the problems are not detected
- A questionnaire, such as AUDIT, should be used when screening patients for hazardous drinking
- Laboratory tests are not recommended for the routine screening of hazardous drinking in primary care

Alcohol consumption is an established part of New Zealand culture, with 80% of all adults over the age of 18 years, identifying themselves as current drinkers.<sup>1</sup> It has been estimated that 20–25% of New Zealanders consume alcohol at a harmful or hazardous level.<sup>2,3</sup> However, the harms associated with alcohol are not just confined to the heaviest drinkers. Research from Finland identified that the majority of alcohol related problems in people who drank were seen in the 90% that consumed alcohol moderately, compared to the 10% that drank heavily.<sup>4</sup> It is likely that the majority of people seen in general practice in New Zealand, with alcohol-related problems, are non-dependent drinkers.

Binge drinking is frequently identified as a problem in New Zealand, but is difficult to quantify as the definitions of “heavy drinking” or “binge drinking” vary considerably.<sup>5</sup> While the official definition of binge drinking is six or more standard drinks in one session, research shows that most New Zealanders think binge drinking means having more than 14 standard drinks in a single session.<sup>6</sup>

There is also a lack of clarity surrounding the terminology used to describe unsafe drinking. Commonly used phrases include; risky drinking, hazardous drinking, alcohol-related risk, alcohol dependence, alcoholism and binge drinking. In addition, varying opinions exist about the quantity of alcohol required to satisfy these definitions.<sup>7</sup>

The terms recommended by the National Health Committee to best explain hazardous drinking are:<sup>2</sup>

- Alcohol misuse – repeated use despite recurrent adverse consequences
- Alcohol dependence – alcohol misuse combined with tolerance, withdrawal and an uncontrollable urge to drink

# The definition of alcohol misuse and alcohol dependence

The American Psychiatric Association's classification system (DSM-IV) has set criteria for the syndromes of alcohol abuse and alcohol dependence.

## Alcohol abuse (alcohol misuse)

The key features of the abuse syndrome are:

A maladaptive pattern of alcohol use causing clinically significant distress or impairment of social or occupational functioning.

Maladaptive use can include high daily consumption (e.g. seven drinks or more each day for men, five or more for women), regular heavy weekend drinking and binge drinking (staying drunk for days, often after periods of abstinence).

One or more of the following features must have occurred as a result of recurrent alcohol use within a 12 month period:

1. **Failure to fulfil major role obligations**, e.g. repeated absences or poor work performance related to alcohol use; suspensions, or expulsions from school; neglect of the children or household.
2. **Exposure to physical hazards**, e.g. driving an automobile or operating machinery when impaired by alcohol use.
3. **Legal problems**, e.g. arrests for alcohol related disorderly conduct.
4. **Social or interpersonal problems**, e.g. arguments with a partner about consequences of intoxication, physical fights whilst drunk.

N.B. A diagnosis of alcohol abuse syndrome is not made if the person is dependent on alcohol.

---

Adapted from: Guidelines for Recognising, Assessing and Treating Alcohol and Cannabis Abuse in Primary Care, National Health Committee, 1999.<sup>2</sup>

## Alcohol dependence

The key features of alcohol dependence syndrome are:

A maladaptive pattern of alcohol use leading to clinically significant impairment or distress, as manifested by three (or more) of the following, occurring at any time in the same 12 month period:

1. **Tolerance**, as defined by either:
  - a) A need for markedly increased amounts of alcohol to achieve intoxication or the desired effect
  - b) Continued use of the same amount of alcohol with markedly diminished effect
2. **Withdrawal**, as manifested by two or more of the following occurring after cessation or reduction of heavy prolonged alcohol use:
  - a) Autonomic hyperactivity such as sweating or heart rate in excess of 100 beats per minute
  - b) Hand tremor
  - c) Nausea or vomiting
  - d) Transient visual auditory or tactile
  - e) Hallucinations
  - f) Psychomotor agitation
  - g) Anxiety
  - h) Grand mal seizures
3. Alcohol is consumed in larger amounts or over a longer period than was intended
4. There is a persistent desire or unsuccessful efforts made to cut down or control alcohol use
5. A great deal of time is spent in activities necessary to obtain alcohol, consume it, or recover from its effects
6. Important social, occupational or recreational activities are given up or reduced because of alcohol use
7. Alcohol use is continued despite a physical or psychological problem that is likely to have been caused or exacerbated by the substance

## The role of general practice in detecting and managing hazardous drinking

Approximately 80–90% of people visit a GP at least once a year,<sup>8</sup> placing general practice in an ideal position for identifying hazardous drinking. However, a high level of suspicion may be required to detect alcohol related issues as they can be easily missed or “disguised” by other health problems. It has been previously estimated that between 65% and 82% of patients who presented to general practice, with alcohol related problems, did not have these problems detected,<sup>2</sup> and only approximately 13% received any treatment for their drinking.<sup>9</sup>

Screening for alcohol consumption among patients in primary care has many potential benefits, including:<sup>10</sup>

- An opportunity to educate patients about low-risk consumption levels and the risks of excessive alcohol use
- May help with the diagnosis of the patient’s presenting condition
- May alert clinicians to the need to advise patients whose alcohol consumption might adversely affect their use of medications and other aspects of current treatment
- An opportunity for practitioners to take preventative measures that have proven effectiveness in reducing alcohol-related risks

It is currently recommended that a useful approach for detecting hazardous drinking is to ask a simple screening question, followed by a more focused questionnaire if required. Studies have shown that validated questionnaires are the best way to screen for hazardous alcohol use. They are more sensitive, more specific and less expensive than blood tests, which are only indicated as an adjunct to screening.<sup>11</sup>

## Simple screening for hazardous drinking

Integrating two to three simple questions about alcohol use into a primary care consultation can provide an opening for a more in-depth discussion.<sup>12</sup>

Have you ever drunk more than you meant to in the last year?

Have you felt that you wanted to cut down on your drinking in the past year?

If yes, is this something you would like help with?

It is important the results are not over interpreted. If the answers to these questions raise concerns, this should be followed up with a more detailed questionnaire about alcohol use (see below).

## Questionnaires for assessing hazardous drinking

There are a number of questionnaires available for the assessment of hazardous drinking, including CAGE, MAST AUDIT and AUDIT-C, which are relatively easy to understand and administer.

The **Alcohol Use Disorders Identification Test (AUDIT)** was developed by the World Health Organisation as a simple method of screening for excessive drinking and to assist in brief assessment. It has a key role in identifying people who would benefit from reducing or ceasing drinking. It is particularly designed for use by health care practitioners in a range of health settings, but it can also be self administered or used by non-health professionals. The AUDIT is a ten-item questionnaire that measures negative alcohol related consequences as well as total alcohol consumption. The benefit of the AUDIT in general practice is that it provides some discrimination between hazardous, harmful and dependent alcohol use. It has also been validated across a range of cultures (but not for Māori or Pacific peoples), making it mostly suitable for general practice. New Zealand data has shown the AUDIT tool to have a satisfactory detection rate for use in New Zealand general practice.<sup>13</sup>

The **AUDIT-C** is a shortened version of the AUDIT, including only three questions. It has similar validity to the full AUDIT test and is useful as a screening tool to identify patients



who are hazardous drinkers or have active alcohol use disorders (including alcohol misuse or dependence). The rapid use of this tool makes it very appealing for use in the general practice setting.

 See [www.bpac.org.nz](http://www.bpac.org.nz) keyword: addiction-tools for a copy of AUDIT (interview and self-report versions) and AUDIT-C. AUDIT can also be accessed within the *bestpractice* Decision Support depression module, with an electronic version of the results incorporated into the patient record.

The **CAGE** questionnaire screens for lifetime alcohol use problems, using four questions. It is recognised as having value as a screen for alcohol dependence, but has a limited role for the detection of hazardous or harmful alcohol use. For example, in young drinkers, it is less sensitive because it does not identify people who drink excessively, but are not concerned about their drinking.

The **Michigan Alcoholism Screening Test (MAST)** is one of the oldest alcohol screening tests available. It contains 22 “yes” or “no” questions, with six positive responses indicating a drinking problem. Although it is considered reasonably accurate, its disadvantage is the time required to complete and score the test. The MAST has a focus on alcoholism, and is most beneficial in people with established alcohol problems and self-acceptance of their alcohol use.

 For further information about interpreting the results of alcohol screening tests and managing alcohol misuse, see: “Substance misuse and addiction in Maori”, BPJ 28 (Jun, 2010)

## Alcohol biomarkers

Although blood tests frequently show a number of changes in relation to alcohol use, they generally lack sufficient sensitivity and specificity for this purpose, so are not recommended for the routine screening of hazardous drinking in primary care.<sup>14</sup>

The biomarkers traditionally associated with hazardous drinking are gamma glutamyl transferase (GGT), mean cell volume (MCV), alanine aminotransferase (ALT), aspartate aminotransferase (AST) and carbohydrate-deficient transferrin (CDT).<sup>15</sup> Elevation of these biomarkers may suggest heavy alcohol consumption by demonstrating the metabolic and toxic effects that alcohol may have

had on an organ system or blood chemistry. However, it is important to remember that the incidental finding of elevated biomarkers should be interpreted cautiously, due to the relatively low specificity of the tests. Although elevated results may raise the suspicion of excessive alcohol intake, it is important that other causes for elevated results are considered.

To complicate this further, a key feature for many people who have alcohol dependence is denial or minimisation of reported alcohol use. This can result in a mismatch between the observation of abnormal blood results, which may suggest excessive alcohol consumption, and what the patient is self reporting in the screening questionnaires. Elevated results of biomarkers can be useful in offering a further opportunity to discuss reduction of alcohol use.

A summary of the commonly used biomarkers is presented in Table 1.

### GGT

Gamma glutamyl transferase (GGT) is the most commonly recognised alcohol biomarker despite its relatively low sensitivity for detecting increased alcohol intake in the general population. Overall, GGT sensitivity for screening heavy drinking is moderate, ranging from low to high values, depending on the population and setting where it is used. Despite this, it is the hepatic biomarker most strongly associated with alcohol intake.<sup>16</sup>

GGT has a long window of assessment. Values remain elevated for two to three weeks after cessation of heavy drinking and increase within approximately two weeks after a relapse to heavy drinking. Elevation occurs due to alcohol related enzyme induction and also, over time, structural injury to the liver/hepatobiliary system.

Chronic drinking of four or more drinks a day, for four to eight weeks, raises the GGT level, making this test more sensitive in chronic drinkers.<sup>17</sup> Elevations of GGT are usually detected less often in adolescents and young adults who drink heavily. This may be because a certain number of years of exposure to alcohol is needed to cause GGT elevation.<sup>15</sup> The most significant association is that average GGT levels are higher in both current and former drinkers compared to lifetime abstainers, although there is genetic variation in baseline GGT levels. GGT is less sensitive in people aged less than 30 years or greater than 70 years.<sup>18</sup>

**Table 1:** Characteristics of commonly used alcohol biomarkers (Adapted from Center for Substance Abuse Treatment, 2006)<sup>19</sup>

Biomarker	Type of drinking characterised	Sensitivity/Specificity	Examples of possible sources of false positives	General comments
<b>Gamma Glutamyl Transferase (GGT)</b>	Probably at least five drinks/day for several weeks	Moderate/Moderate (as a screen for alcohol dependence)	Liver and biliary disease, smoking, obesity, and medications inducing microsomal enzymes	Traditionally the most commonly used biomarker. Primarily reflects liver damage that is often related to alcohol consumption. Performs best in adults aged 30 to 70 years.
<b>Aspartate Amino Transferase (AST)</b>  <b>Alanine Amino Transferase (ALT)</b>	Unknown, but heavy and lasting for several weeks	Moderate/Moderate (somewhat lower than GGT as screen for alcohol dependence)	As above for GGT  Excessive coffee consumption can lower values	Primarily reflects liver damage that is often related to alcohol. ALT seems less sensitive than AST. Ratios of AST to ALT >2 may suggest liver damage that is alcohol related. Performs best in adults aged 30 to 70 years.
<b>Mean Corpuscular Volume (MCV)</b>	Unknown, but heavy and lasting at least a few months	Low/Moderate-High (sensitivity somewhat below GGT as screen for dependence)	Liver disease, haemolysis, bleeding disorders, anaemia, folate deficiency and medications reducing folate	Poor biomarker for relapse because of slow response to drinking.
<b>Carbohydrate-Deficient Transferrin (CDT)</b>	Probably at least five drinks/day for around two weeks	Moderate/High (as a screen for alcohol dependence)	Iron deficiency, hormonal status in women, carbohydrate-deficient glycoprotein syndrome, fulminant hepatitis C and severe alcohol disease	Equal to, or possibly slightly superior than, GGT but much more specific. Very good biomarker of relapse to drinking following a period of abstinence. Likely less sensitive for women and younger people.

It is very important to note that GGT may be elevated in isolation by a number of conditions not related to alcohol intake, including non-alcohol-related liver diseases, obesity, diabetes, smoking and medications such as anticonvulsants, anticoagulants and barbiturates.<sup>15</sup>

### ALT and AST

Although AST and ALT may be used as markers of heavy alcohol consumption, they are not recommended as they have a lower sensitivity than GGT.<sup>18</sup>

### MCV

A raised mean cell volume (MCV) is frequently used as an alcohol biomarker, as chronic heavy drinking increases the size of red blood cells. MCV appears to have lower sensitivity in males and higher sensitivity in females than GGT and is more specific than GGT. However, there are also numerous sources of potential false positive results including folate and B<sub>12</sub> deficiencies, non-alcohol-related liver diseases, haemolysis, bleeding disorders, hypothyroidism, medications that can induce marrow toxicity and bone marrow disorders.

MCV is most useful for adults aged from 30 to 60 years. MCV values can remain elevated for up to several months after cessation of drinking, due to the long half-life (13 to 27 weeks) of red blood cells.<sup>15</sup>

### CDT

The most recently introduced biomarker for increased alcohol intake is carbohydrate-deficient transferrin (CDT). High alcohol intake reduces the number of carbohydrate (sialic acid) residues attached to this transferrin, thereby increasing the number of carbohydrate deficient sites.

CDT is a more specific biomarker of hazardous alcohol intake than standard markers, although there is some individual genetic variation in CDT levels and several identified sources of false positive results (Table 1). CDT is influenced by factors such as smoking, body weight and female gender.<sup>15</sup>

Regular drinking is required to increase the CDT, and it is usually not affected by binge drinking. Heavy drinking (50 to 80 g alcohol/day) for seven to ten days decreases the carbohydrate content of transferrin, thus increasing the CDT level. Because the baseline value of CDT tends to be fairly specific to an individual patient, CDT is sometimes used to monitor abstinence, as following cessation of drinking, CDT values will usually return to normal within two to three weeks.

### Biomarker combinations

Because all biomarkers have some limitations, one approach to improve accuracy has been to use these tests in combination. The highest sensitivities are obtained with the combination of CDT and GGT, ranging from 65% to 73%. Combinations with AST, ALT and MCV have lower sensitivities of 50%, 35%, and 52%, respectively. The positive predictive value of an isolated raised result in an otherwise low risk patient is likely to be even lower.

**ACKNOWLEDGEMENT:** Thank you to **Vanessa Caldwell** (Ngāi Tahu), National Project Manager, Matua Raki (National Addictions Workforce Development Centre), Wellington for providing expert guidance in developing this article.



## References

1. Alcohol Advisory Council (ALAC). NZ Statistics – New Zealand Drinking Trends. Available from: [www.alcohol.org.nz/NZStatistic.aspx?PostingID=1187](http://www.alcohol.org.nz/NZStatistic.aspx?PostingID=1187) (Accessed Nov, 2010).
2. National Health Committee. Guidelines for recognising, assessing and treating alcohol and cannabis abuse in primary care. Wellington, New Zealand; 1999. Available from: [www.nzgg.org.nz/guidelines/0040/full\\_guideline.pdf](http://www.nzgg.org.nz/guidelines/0040/full_guideline.pdf) (Accessed Nov, 2010).
3. MA Oakley Browne, JE Wells, KM Scott (eds). Te Rau Hinengaro: The New Zealand Mental Health Survey. Wellington: Ministry of Health; 2006.
4. Alcohol Healthwatch. Drinking in New Zealand: Questions and answers. Available from: [www.ahw.org.nz/resources/Toolkit%202009/Alcohol%20Healthwatch%20QAs%20%20Final%202009.pdf](http://www.ahw.org.nz/resources/Toolkit%202009/Alcohol%20Healthwatch%20QAs%20%20Final%202009.pdf) (Accessed Nov, 2010).
5. Szmigin I, Griffin C, Mistral W, et al. Re-framing 'binge drinking' as calculated hedonism: empirical evidence from the UK. *Int J Drug Policy*. 2008;19 (5):359.
6. BRC Marketing and Social Research. The Way We Drink: A Profile of Drinking Culture in New Zealand. Wellington: Alcohol Advisory Council of New Zealand; 2004.
7. International Center for Alcohol Policies. Drinking guidelines. Available from: [www.icap.org/PolicyIssues/DrinkingGuidelines/GuidelinesTable/tabid/204/Default.aspx](http://www.icap.org/PolicyIssues/DrinkingGuidelines/GuidelinesTable/tabid/204/Default.aspx)(Accessed Nov, 2010).
8. Cumins AM. General Practice diabetes case detection audit. University of Otago Summer Studentship 2006/07. University of Otago. Available from: [www.chmeds.ac.nz/departments/pubhealth/students/cumins.htm](http://www.chmeds.ac.nz/departments/pubhealth/students/cumins.htm) (Accessed Nov, 2010).
9. Wells JE, Bushnell JA, Joyce PR, et al. Preventing alcohol problems: the implications of a case-finding study in Christchurch, New Zealand. *Acta Psychiatr Scand* 1991;83(1):31–40.
10. Babor TF, Higgins-Biddle JC, Saunders JB, Monteiro M. AUDIT – the Alcohol Use Disorder Identification Test: guidelines for use in primary health care. 2nd edition. Geneva, Switzerland: World Health Organization, Department of Mental Health and Substance Abuse; 2001.
11. Coulton S, Drummond C, James D, et al. Opportunistic screening for alcohol use disorders in primary care: Comparative study. *BMJ* 2006;332(7540):511-7.
12. Isaacson JH, Schorling JB. Screening for alcohol problems in primary care. *Med Clin North Am* 1999;83(6)1547-63.
13. Paton-Simpson G, McCormick IR; Powell A, et al. Problem drinking profiles of patients presenting to general practitioners: Analysis of Alcohol Use Disorders Identification Test (AUDIT) scores for the Auckland area. *N Z Med J* 2000;113(1105):74-7.
14. Clinical Knowledge Summaries. Alcohol problem drinking. NHS, 2010. Available from: [www.cks.nhs.uk](http://www.cks.nhs.uk) (Accessed Nov, 2010).
15. Litten RZ, Bradley AM, Moss HB. Alcohol biomarkers in applied settings: Recent advances and future research opportunities. *Alcohol Clin Exp Res* 2010;34(6):941-5.
16. Stranges S, Freudenhein JL, Muti P, et al. Differential effects of alcohol drinking pattern on liver enzymes in men and women. *Alcohol Clin Exp Res* 2004;28(6):949-56.
17. Miller PM, Anton RF. Biochemical alcohol screening in primary health care. *Addict Behav* 2004;29(7):1427–37.
18. Peterson K. Biomarkers for alcohol use and abuse. *Alcohol Res Health* 2004;28(1):30-7.
19. Center for Substance Abuse Treatment. The role of biomarkers in the treatment of alcohol use disorders. *Substance Abuse Treatment Advisory* 2006;5(4).