Risk Factors Measured During Medical School for Later Hazardous Drinking: A 10-year, Longitudinal, Nationwide Study (NORDOC)†

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†The Longitudinal Study of Norwegian Medical Students and Doctors.

Received 10 March 2015; Revised 10 March 2015; Accepted 19 May 2015

Abstract

Aims: To investigate the prevalence and temporal patterns of hazardous drinking and risk factors during medical school for future hazardous drinking among doctors.

Methods: Two cohorts of graduating medical students (N=1052) from all four Norwegian universities (NORDOC) were surveyed in their final year of medical school training (1993/94 and 1999) (T1) and again 4 (T2) and 10 (T3) years later. Longitudinally, 53% (562/1052) of the sample responded at all three time points. Hazardous drinking was defined as drinking five or more drinks during one session at least 2–3 times per month. Predictors of hazardous drinking, identified by logistic regression models after controlling for cohort, included a parental history of alcohol problems, having children, no religious activity, use of alcohol to cope with tension and some personality traits.

Results: There was a significant decline in the prevalence of hazardous drinking from T1 (14%) to T2 (10%) but not from T2 to T3 (8%). Approximately 23% of hazardous drinkers at T1 remained hazardous drinkers at T3 (N=18). At T2, significant adjusted predictors included male gender (OR = 2.0, P = 0.04), use of alcohol as a coping strategy (OR = 2.2, P = 0.03) and hazardous drinking at T1 (OR = 9.8, P < 0.001). The significant adjusted predictors at T3 included older age (OR = 1.1, P = 0.01), male gender (OR = 3.6, P = 0.002) and hazardous drinking at T1 (OR = 7.5, P < 0.001).

Conclusions: Hazardous drinking and drinking to cope with tension during medical school were the most important predictors of later hazardous drinking and should be targets of preventive efforts in medical schools.

INTRODUCTION

Alcohol is the most common substance of abuse among doctors who seek treatment for addiction (Gossop et al., 2001; Mclellan et al., 2008). Physicians’ drinking behaviour may impact their ability to properly care for patients. Indeed, alcohol abuse among doctors has been associated with increased risk of medical errors (Oreskovich et al., 2014). In addition, doctors’ attitudes towards health and drinking behaviours may influence their preventive counselling practices (Frank et al., 2008).

Hazardous drinking over time increases the risk of alcohol dependence (Dawson et al., 2008). It is evident that studying medicine or working as a physician does not in itself prevent harmful alcohol
use. Efforts to prevent hazardous drinking early in doctors’ careers are therefore of great importance. Such efforts need to be informed by the characteristics of medical students who engage in hazardous drinking. Do hazardous student drinkers continue this drinking pattern following medical school, or is it isolated to their student role? (Wechsler et al., 1994) Some doctors begin hazardous drinking later in their career. Is their drinking pattern or other characteristics during medical school predictive of later hazardous drinking?

To answer these questions, we need a prospective study of a representative sample of medical students who are followed for years after medical school. Well-documented factors associated with hazardous drinking among medical students include male gender, having no children, religious affiliations (Tyssen et al., 1998; Katoja et al., 2013) and having parents with alcohol problems (Bohman et al., 1981; Lieberman, 2000). We have also previously demonstrated that the use of alcohol to cope with tension predicts hazardous drinking in medical students (Kjobli et al., 2004), as do low levels of conscientiousness in male medical students (Kjobli et al., 2004). Do these factors also predict hazardous drinking later in the medical career?

The present prospective and longitudinal study investigates the patterns of and risk factors for hazardous drinking in a representative national sample of Norwegian medical students and doctors (NORDOC) from all four Norwegian universities who were surveyed during their final year of medical school training (T1), 4 years after graduation (T2) and 10 years after graduation (T3), by which time many doctors have well-established jobs.

The definition of hazardous drinking is controversial. The National Institute on Alcohol Abuse and Alcoholism (NIAAA) defines binge drinking as ‘a pattern of drinking that brings blood alcohol concentration (BAC) levels to 0.08 g/dl. This typically occurs after four drinks for women and five drinks for men—in about 2 hr’ (National Institute on Alcohol Abuse and Alcoholism (NIAAA), 2015). Because this definition of hazardous drinking (based on the level and frequency of drinking) was used in this and other studies (Naimi et al., 2003) but has not been well validated in populations beyond early adulthood (Wechsler et al., 1994), we also aimed to validate this definition by investigating expected associations with hypertension, gastritis and sleeping problems (Bujanda, 2000; Stein and Friedmann, 2006; Briasoulis et al., 2012).

We address the following questions:

1. What is the prevalence of hazardous drinking at the end of medical school and 4 and 10 years after graduation, and what is the stability of such drinking over these periods?
2. Which individual factors during medical school predict hazardous drinking 4 and 10 years after graduating?

**METHODS**

**Sample and study design**

Medical students from all four Norwegian universities were included. The Medical Student Cohort in 1999 (N = 421) and the Young Doctor Cohort, who graduated in 1993/94 (N = 631), were both (N = 1052) followed and surveyed at three similar time points: T1, during their final year of medical school (N = 892/1052, 85% of the eligible population); T2, 4 years after graduation (N = 780/1052, 74% of the eligible population); and T3, 10 years after graduation (N = 708/1052, 67% of the eligible population). Among those who responded at all three time points (562/1052, 53% of the eligible population), 58% were women (328/562) and 42% (234/562) were men.

**Measures**

**Dependent variables**

Hazardous drinking (binge drinking or drinking to intoxication) was defined as drinking a total of 60 g of ethanol (approximately 5 alcoholic units) or more in one session at least 2–3 times per month during the last year. This question, previously described (Tyssen et al., 1998), has the following response options: none = 0; 1–4 times per year = 1; 5–10 times per year = 2; 1 time per month = 3; 2–3 times per month = 4; once a week = 5; 2–4 times a week = 6; and daily or almost daily = 7. This question is a modified version of the third item (Tyssen et al., 1998) of the original 10-item version of the Alcohol Use Disorder Identification Test (AUDIT) (Saunders et al., 1993) and has been determined to be the best AUDIT screening item for detecting alcohol problems among men in general medical settings (Bush et al., 1998; Aalto et al., 2009).

Before analysis, we dichotomized hazardous drinking as 0 (1 time per month or less frequently) and 1 (2–3 times per month or more frequently), which corresponds to the level of hazardous drinking that has been linked to negative health consequences among American college students (Wechsler et al., 1994). We have validated this cut-off in our previous studies (Tyssen et al., 1998; Kjobli et al., 2004; Grotmol et al., 2010). Hazardous drinking was measured at T1, T2 and T3, but at T1, hazardous drinking was only included as a predictor variable.

To further validate our hazardous drinking measure, we used data pertaining to self-prescribed medications (Hem et al., 2005). We compared the use of medications for three common health problems associated with excessive drinking: hypertension, gastritis and sleep problems (Bujanda, 2000; Stein and Friedmann, 2006; Briasoulis et al., 2012). At T2, hazardous drinkers reported a significantly higher use of antacids (23.4 vs. 11.4%, P = 0.006), antihypertensive drugs (3.9 vs. 0.3%, P = 0.008) and close to significant higher use of hypnotics (13.0 vs. 6.9%, P = 0.06) compared with non-hazardous drinkers. At T3, hazardous drinkers reported a significantly higher use of antacids (30.2 vs. 15.0%, P = 0.01) and hypnotics (20.8 vs. 9.0%, P = 0.01) compared with non-hazardous drinkers, but not antihypertensive drugs (0.0 vs. 1.2%, P > 0.99).

**Predictor variables**

Descriptions of all independent variables are provided in Table 1. In addition to age and gender, we measured having children with the question ‘How many children do you have?’ and response categories none = 0, one child = 1, two children = 2, and three or more children = 3. This variable was dichotomized as no children = 0 and one or more children = 1.

Religious activity was measured with the question ‘Do you engage in any type of religious activity?’ and response categories that have been reported previously (Tyssen et al., 1998). Before analysis, we

<table>
<thead>
<tr>
<th>Table 1. Description of the independent variables at T1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent variables at T1</td>
</tr>
<tr>
<td>Age</td>
</tr>
<tr>
<td>Females</td>
</tr>
<tr>
<td>One or more children</td>
</tr>
<tr>
<td>No religious activity</td>
</tr>
<tr>
<td>History of parental alcohol problems</td>
</tr>
<tr>
<td>Vulnerability</td>
</tr>
<tr>
<td>Intensity</td>
</tr>
<tr>
<td>Reality weakness</td>
</tr>
<tr>
<td>Control</td>
</tr>
<tr>
<td>Use of alcohol to cope with tension</td>
</tr>
<tr>
<td>Hazardous drinking</td>
</tr>
</tbody>
</table>
and 2013/1585 REK South East C) and was approved by the Norwegian Data Inspectorate.

RESULTS

Prevalence and stability of hazardous drinking

The prevalence of hazardous drinking was 14% at T1 (7% for women, 25% for men; OR = 4.3, 95% CI = 2.5–7.3, P < 0.001), 10% at T2 (5% for women, 16% for men; OR = 3.4, 95% CI = 1.8–6.3, P < 0.001) and 8% at T3 (3% for women and 15% for men; OR = 5.2, 95% CI = 2.5–10.8, P < 0.001). There was a significant decline in the prevalence of hazardous drinking from T1 to T2 (P = 0.001) but not from T2 to T3.

In additional analyses, we observed that 23% of those who drank hazardously at T1 (N = 18) continued to exhibit this behaviour at both T2 and T3.

Predictors of hazardous drinking at T2

The following variables were significant univariate predictors (Table 2): high age, male gender, no religious activity, high intensity, low levels of control, use of alcohol to cope with tension and hazardous drinking at T1.

The following variables were adjusted predictors in the first model (Table 2): male gender (OR = 3.5 (1.8–6.8), P < 0.001), no religious activity (OR = 3.1 (1.2–7.7), P = 0.01), intensity (OR = 1.1 (0.9–1.3), P = 0.07) and use of alcohol to cope with tension (OR = 3.3 (1.6–6.7), P = 0.001). In the second and final model, the following variables remained significant: male gender (OR = 2.0 (1.01–4.1), P = 0.04), use of alcohol to cope with tension (OR = 2.2 (1.05–4.8), P = 0.03) and hazardous drinking at T1 (OR = 9.8 (4.9–19.5), P < 0.001). No religious activity and high intensity (extraversion) were mediated by the variable hazardous drinking at T1. No interactions were identified between gender or cohort and each of the significant predictors; hence, the predictor effects did not differ between the genders or cohorts.

Predictors of hazardous drinking at T3

The following variables were significant univariate predictors (Table 3): high age, male gender, history of parental alcohol problems, low levels of control, use of alcohol to cope with tension and hazardous drinking at T1.

The following variables were adjusted predictors in the first model (Table 3): age (OR = 1.1 (0.9–1.2), P = 0.07), male gender (OR = 5.2 (2.3–11.3), P < 0.001), history of parental alcohol problems (OR = 2.5 (0.8–7.3), P = 0.09), control (OR = 0.8 (0.7–1.01), P = 0.07) and use of alcohol to cope with tension (OR = 2.4 (1.09–5.6), P = 0.03). In the second and final model, the following variables remained significant: age (OR = 1.1 (1.02–1.2), P = 0.01), male gender (OR = 3.6 (1.6–8.2), P = 0.002), and hazardous drinking at T1 (OR = 7.5 (3.4–16.7), P < 0.001). Thus, the variables history of parental alcohol problems, control (or conscientiousness) and use of alcohol to cope with tension were mediated by the variable hazardous drinking at graduation. There were no interactions with gender or cohort in this model. We found no significant effect of age squared, indicating that the effect of age was linear.

DISCUSSION

There are two main findings from this study. First, the prevalence of hazardous drinking was reduced by half from medical school to 10 years after graduation. This pattern coincides with follow-up and
Table 2. Risk factors of hazardous drinking 4 years after graduation (T2)

<table>
<thead>
<tr>
<th>Variables at T1</th>
<th>OR</th>
<th>95% CI</th>
<th>P</th>
<th>OR</th>
<th>95% CI</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.08</td>
<td>1.003–1.1</td>
<td>0.04</td>
<td>1.04</td>
<td>0.9–1.1</td>
<td>0.35</td>
</tr>
<tr>
<td>Male gender</td>
<td>3.0</td>
<td>1.8–5.0</td>
<td>&lt;0.001</td>
<td>3.5</td>
<td>1.8–6.8</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Children</td>
<td>0.7</td>
<td>0.3–1.3</td>
<td>0.32</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No religious activity</td>
<td>2.7</td>
<td>1.3–5.6</td>
<td>0.007</td>
<td>3.1</td>
<td>1.2–7.7</td>
<td>0.01</td>
</tr>
<tr>
<td>History of parental alcohol problems</td>
<td>1.8</td>
<td>0.8–3.8</td>
<td>0.13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cohort</td>
<td>0.7</td>
<td>0.4–1.2</td>
<td>0.28</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vulnerability</td>
<td>0.9</td>
<td>0.8–1.0</td>
<td>0.29</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intensity</td>
<td>1.1</td>
<td>1.01–1.3</td>
<td>0.02</td>
<td>1.1</td>
<td>0.9–1.3</td>
<td>0.07</td>
</tr>
<tr>
<td>Reality weakness</td>
<td>1.06</td>
<td>0.9–1.2</td>
<td>0.42</td>
<td>1.1</td>
<td>0.9–1.3</td>
<td>0.07</td>
</tr>
<tr>
<td>Control</td>
<td>0.8</td>
<td>0.7–0.9</td>
<td>0.01</td>
<td>0.9</td>
<td>0.7–1.07</td>
<td>0.30</td>
</tr>
<tr>
<td>Use of alcohol to cope with tension</td>
<td>3.5</td>
<td>2.0–6.3</td>
<td>&lt;0.001</td>
<td>3.3</td>
<td>1.6–6.7</td>
<td>0.001</td>
</tr>
<tr>
<td>Hazardous drinking</td>
<td>15.5</td>
<td>8.8–27.3</td>
<td>&lt;0.001</td>
<td>7.3</td>
<td>3.4–16.7</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

OR, odds ratio; CI, confidence interval.

*Variable not significant in the unadjusted analysis, therefore not included in the adjusted analysis.

*Variable not included in the first model.

*Variable not significant in the first model, therefore not included in the second model.

Table 3. Risk factors of hazardous drinking 10 years after graduation (T3)

<table>
<thead>
<tr>
<th>Variables at T1</th>
<th>OR</th>
<th>95% CI</th>
<th>P</th>
<th>OR</th>
<th>95% CI</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>1.1</td>
<td>1.01–1.2</td>
<td>0.02</td>
<td>1.1</td>
<td>0.9–1.2</td>
<td>0.07</td>
</tr>
<tr>
<td>Male gender</td>
<td>5.3</td>
<td>2.7–10.3</td>
<td>&lt;0.001</td>
<td>5.2</td>
<td>2.3–11.3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Children</td>
<td>1.03</td>
<td>0.5–2.0</td>
<td>0.93</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No religious activity</td>
<td>1.5</td>
<td>0.7–3.2</td>
<td>0.22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>History of parental alcohol problems</td>
<td>2.4</td>
<td>1.07–5.4</td>
<td>0.03</td>
<td>2.5</td>
<td>0.8–7.3</td>
<td>0.09</td>
</tr>
<tr>
<td>Cohort</td>
<td>1.1</td>
<td>0.6–2.0</td>
<td>0.59</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vulnerability</td>
<td>0.9</td>
<td>0.8–1.06</td>
<td>0.26</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intensity</td>
<td>1.09</td>
<td>0.9–1.2</td>
<td>0.20</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reality weakness</td>
<td>0.9</td>
<td>0.8–1.2</td>
<td>0.93</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control</td>
<td>0.7</td>
<td>0.6–0.9</td>
<td>0.006</td>
<td>0.8</td>
<td>0.7–1.01</td>
<td>0.07</td>
</tr>
<tr>
<td>Use of alcohol to cope with tension</td>
<td>2.7</td>
<td>1.3–5.5</td>
<td>0.005</td>
<td>2.4</td>
<td>1.09–5.6</td>
<td>0.03</td>
</tr>
<tr>
<td>Hazardous drinking</td>
<td>9.7</td>
<td>5.2–18.2</td>
<td>&lt;0.001</td>
<td>15</td>
<td>5.6–3.8</td>
<td>0.03</td>
</tr>
</tbody>
</table>

OR, odds ratio; CI, confidence interval.

*Variable not significant in the unadjusted analysis, therefore not included in the adjusted analysis.

*Variable not included in the first model.

Cross-sectional studies in the general population, which generally demonstrate a decline in hazardous drinking during and beyond early adulthood (Donovan et al., 1983; Hammer and Vaglum, 1990; Naimi et al., 2003). However, it is important to note that despite a decline in the prevalence of hazardous drinking, a quarter of those who drank hazardedly in medical school maintained this (risky) behaviour 10 years later. Hence, this should not be considered a transient phenomenon that ceases naturally after graduation. These individuals may have developed a more serious alcohol disorder that, in the worst cases, may lead to professional problems.

Second, several risk factors for later hazardous drinking were identified. Hazardous drinking in medical school was found to be an important predictor for later hazardous drinking. Hence, medical schools should focus their curriculum on alcohol-related problems and the degree to which the use of alcohol in student organization activities may stimulate hazardous drinking.

The finding that male physicians drink hazardedly more often than female physicians is consistent with other studies of medical students and doctors (Frank et al., 2008; Rosta, 2008; Rosta and Aasland, 2013) and the general population (Hasin et al., 2007). A recent American study found more alcohol abuse among women physicians than among male physicians but was hampered by a low response rate (27%) (Oreskovich et al., 2014). Personality traits did not have direct effects on later hazardous drinking but did predict hazardous drinking during medical school (Kjøbli et al., 2004). Therefore, personality seems to be a more important predictor among undergraduate students. A history of parental alcohol problems and not participating in religious activities both mediated hazardous drinking during medical school. The use of alcohol to cope with tension was a significant predictor of hazardous drinking 4 years after graduation, even after controlling for other factors that predict alcohol problems. Doctors may drink to cope with tension because of the
CONFLICT OF INTEREST STATEMENT

None declared.

REFERENCES


