

Gender Differences In The Relationships Between Alcohol, Tobacco And Mental Health In Patients Attending An Emergency Department

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Abstract

Aims: There is evidence of a non-linear relationship between alcohol consumption and mental health status, and of an association between tobacco use and poor mental health. This paper examines the nature of the association between usual alcohol consumption, tobacco use and symptoms of anxiety and depression in Emergency Department patients in Queensland, Australia. **Methods:** A cross sectional survey of patients aged 16–84 presenting for treatment over a 14 day period to Gold Coast Hospital Emergency Department using socio-demographic items, the Alcohol Use Disorders Identification Test (AUDIT) to measure moderate, hazardous and harmful alcohol consumption, and the Hospital Anxiety and Depression Scale (HADS) to measure state anxiety and depression. **Results:** 812 patients were interviewed. Gender differences in results were evident. For men, there was a U-shaped relationship between alcohol consumption and anxiety/depression, and a linear association between smoking and anxiety. For women, alcohol consumption and anxiety/depression showed a more linear relationship, but there was no significant relationship between tobacco use and anxiety/depression. **Conclusions:** There may be important gender differences in the relationships between alcohol consumption, tobacco use and mental health status. This study supports previous evidence that mental health status of non-drinkers is worse than that of moderate drinkers, but only among males.

INTRODUCTION

Tobacco use and excessive alcohol consumption remain two major public health problems (Ezzati *et al.*, 2002; World Health Organization, 2002). The evidence also suggests an association between poor mental health and substance use disorders (Power *et al.*, 1998; Rodgers *et al.*, 2000b; Degenhardt *et al.*, 2000, 2001; Degenhardt and Hall, 2001). Individuals who report more symptoms of anxiety and depression are also highly represented amongst those who smoke tobacco and consume alcohol at harmful levels (Degenhardt and Hall, 2001, 2003; Caldwell *et al.*, 2002; World Health Organization, 2002). This paper aims to further investigate the nature of the relationship between mental health and substance use problems.

Alcohol use, anxiety and depression

Harmful alcohol use and alcohol dependence are the most frequently experienced substance use disorders in Australia (Degenhardt and Hall, 2003). Amongst those diagnosed with substance use disorders, alcohol disorders are three times more common than illicit drug disorders (Henderson *et al.*, 2000) and their co-occurrence with anxiety and affective disorders is high (Degenhardt and Hall, 2001, 2003). While the association between harmful alcohol use and mental health problems is well established, the precise nature of the relationship between alcohol use in general and mental health remains unclear. Some recent studies have suggested a non-linear or 'U-shaped' relationship between anxiety and depression and the use of alcohol (Power *et al.*, 1998; Rodgers *et al.*, 2000b; Caldwell *et al.*, 2002), such that both hazardous/harmful drinking and abstinence from alcohol are associated with higher rates of depression and anxiety than moderate/non-hazardous drinking (Rodgers *et al.*, 2000b; Degenhardt and Hall, 2001; Caldwell *et al.*, 2002).

These findings are reminiscent of the literature on alcohol consumption and physical health where moderate drinkers, particularly males, live longer and appear to have a variety of health advantages, when compared with non-drinkers (World Health Organization, 2002). Whereas these health benefits are often attributed to the protective effect of alcohol on cardiovascular activity (National Health and Medical Research Council, 2001), the reasons for a non-linear association between alcohol consumption and anxiety and depression are less clear. One suggestion is that alcohol may have a protective effect on mental health—that the lower symptoms of anxiety and depression amongst moderate drinkers may reflect the better societal adjustment that moderate drinkers experience as a result of their patterns of alcohol consumption (Rodgers *et al.*, 2000a). Another view is that among alcohol abstainers there may exist a distinct subgroup who have had an alcohol problem in the past, and who are characterized by the same mental health patterns as those who drink heavily (Goldman and Najman, 1984; Rodgers *et al.*, 2000b). A second ‘artefactual’ explanation for the observed non-linear relationship between alcohol consumption and mental health is that non-drinkers may share with heavy drinkers a variety of circumstances, such as low socio-economic status (Rodgers *et al.*, 2000a), which are known to correlate positively with poorer health.

Tobacco use, anxiety and depression

High levels of alcohol use are often associated with tobacco use. In Australia, those who drink are between 1.8 and 4.2 times more likely to smoke tobacco, with those meeting the DSM-IV criteria for alcohol disorder being much more likely to smoke tobacco (Degenhardt and Hall, 2003). Smoking is therefore positively associated with heavy alcohol use. Given that alcohol disorders are associated with anxiety and depression, a similar association may exist between tobacco use and mental health.

Although evidence for this association is limited at present, two population surveys have supported a strong association between regular tobacco use and poorer mental health in the general population. In a stratified probability sample of 10 641 adults, representative of the Australian population, Degenhardt and Hall (2001) found that regular tobacco users were significantly more likely than non-smokers to experience both alcohol disorders and higher rates of anxiety and affective disorders. In another large ($n = 2725$) community sample of Australian adults, Jorm *et al.* (1999) found a significant association between tobacco use and both anxiety and depression. In both studies, these relationships did not appear to be a consequence of confounding.

If smoking and mental health are indeed associated, one question of interest is whether the nature of this association is similar to that observed between alcohol and mental health. If this were the case, then one might expect moderate tobacco consumption to confer some mental health benefits, with both non-smokers and heavy smokers characterized by relatively poorer mental health. However this would counter findings from the mortality literature, in which no health benefits are gained in consuming tobacco, and a negative linear relationship is found between tobacco use and physical health status (World Health Organization, 2002). It is therefore of some interest to examine differences in mental health status across the whole spectrum of tobacco consumption.

Emergency Departments are a potential first point of contact for a range of health problems, and are thus an excellent opportunity for screening and early identification. Hazardous and harmful drinking are common among patients of Emergency Departments both in Australia and overseas (Spirito *et al.*, 2001; Cassar *et al.*, 2002; Tait *et al.*, 2002; Woolfenden *et al.*, 2002; Barnett *et al.*, 2003; Rockett *et al.*, 2003). The interplay between alcohol or tobacco use and mental health has received relatively little attention in an Australian Emergency Department context. Evidence of a nonlinear relationship between alcohol or tobacco use and mental health, in Emergency Department populations, would carry important implications for public health research and intervention.

The following paper has three aims. First, it will examine the prevalence of alcohol consumption, tobacco use, and symptoms of anxiety and depression in a sample of patients presenting to an Emergency Department in a large, metropolitan hospital in south-east Queensland, Australia. Second, it will explore the nature of the relationship between anxiety/depression and alcohol consumption in an Emergency Department setting. Third, it will examine the nature of any association between anxiety/depression and tobacco use in this population.

METHODS

Study design and setting

A cross-sectional survey was conducted 24 h per day over a 14-day period in October 2002. Participants were patients who presented for treatment at the Gold Coast Hospital Emergency Department (ED). The Gold Coast is a densely populated area and a major destination for both Australians and overseas tourists. The Gold Coast Hospital is the only public hospital in the region and is situated opposite a

private hospital. It is therefore more likely to attract patients who are less wealthy and may not have access to private health insurance.

Sample

A sequential list of all eligible patients (in order of presentation to the hospital) was generated from hospital computer records. Eligible patients were aged 16–84 years, able to be interviewed and able to give informed consent. Patients were approached for interview on the basis that they met these eligibility criteria. Previous research carried out in this setting (Roche *et al.*, 2001) suggested that the resources available would not enable the interviewers to approach every patient for interview. Over the course of the study, four out of every five eligible patients were successfully interviewed. In situations where more than one eligible patient was available for interview at a given time, patients were approached in the order in which they had presented, with the non-selected patient potentially lost to interview. Consent was obtained from patients for participation in a 20 min, face-to-face interview.

Of 1446 presenting patients, 280 were not approached, in accordance with study protocol. A further 178 patients were not eligible for participation (63 could not be interviewed due to the severity of their condition, and 115 did not wait for medical treatment). Thus, of 988 eligible patients, 812 (82.2%) were interviewed, 107 (10.8%) refused to participate, and 69 (7.0%) patients received treatment and left hospital before they could be interviewed.

Measures

Measures included participants' socio-demographic characteristics, usual level of tobacco consumption, and two standardized instruments to assess (i) levels of alcohol consumption and (ii) prevalence of anxiety and depression. Socio-demographic information included data regarding age, gender, Australian residency, indigenous status, marital status, education, household income and private health insurance.

Participants were asked to report on their current tobacco use, measured as the number of cigarettes they smoke on an average day ('How many cigarettes do you smoke on an average day?'). For the purposes of analysis and interpretation, this continuous measure of current tobacco use was categorized into four levels of tobacco consumption, based on the reported average number of cigarettes smoked per day: non-smoker (0 cigarettes), light smoker (1–9 cigarettes), moderate smoker (10–19 cigarettes) and heavy smoker (20+ cigarettes). Usual alcohol consumption was assessed using the Alcohol Use Disorders Identification Test (AUDIT, Babor *et al.*, 1992). The AUDIT is a 10-item screening instrument designed to measure three domains of alcohol use: consumption (items 1–3), dependence (items 4–6) and related problems (items 7–10). AUDIT scores fall into four categories: non-drinker (score = 0), non-hazardous drinking (females: 1–6; males: 1–7), hazardous drinking (females: 7–12; males: 8–14) and harmful drinking (females: 13–40; males: 15–40). Cut-offs used in this study follow those identified by the scale authors, which were found to have a sensitivity of 95–100% in a population of 913 drinking patients (Babor *et al.*, 1992). In the present study, the AUDIT was found to have a reliability (Cronbach's alpha) of 0.84. Blood alcohol concentration (BAC) was not measured in this study.

Mental health was assessed using the Hospital Anxiety and Depression Scale (HADS), a self-report measure designed to detect symptoms of state anxiety and depression in non-psychiatric hospital settings (Zigmond and Snaith, 1983). The scale contains seven depression items (four reverse scored) and seven anxiety items, rated on a four-point scale. On each subscale, a score of 7 or less is considered a non-case, 8–10 a doubtful case, and 11 or more a definite case (Zigmond and Snaith, 1983). In the present sample the scales had a reliability (Cronbach's alpha) of 0.83 (anxiety) and 0.78 (depression).

Covariates used in the multivariate analysis included age, education, income and urgency of case at presentation (measured by using the Australian Triage Scale) (ACEM, 2004). Age ranged from 16 to 84, education from primary school to university, income from less than \$10 000 per annum to more than \$50 000 per annum, and Triage Code from more urgent (2) to less urgent (5). All covariates were treated as continuous variables. The Triage Code allocated to patients on presentation by hospital staff was obtained from the Emergency Department patient records system.

RESULTS

Over half ($n = 452$; 56%) of the sample was male and the average age was 40.11 years (range 16–84 years). Over 95% of participants were Australian residents and fewer than 3% identified as indigenous; roughly equal numbers were single (41%) and married or *de facto* (42%). At the time of presentation just over half (54%) were employed and fewer than one in five (15.3%) reported a total household income in excess of \$50 000. Only 13% of participants reported holding private health insurance (see

Table 1).

AUDIT scores, HADS scores and level of tobacco consumption are presented in Table 2, as a function of gender. Slightly more than 40% of the sample used tobacco. Almost one third (30.5%) drank at hazardous/harmful levels, and the prevalence of anxiety (18%) was higher than the prevalence of depression (5.6%). Chi-square analysis revealed that more females than males were non-drinkers or non-hazardous drinkers, whereas more males reported drinking at hazardous and harmful levels ($\chi^2 (3) = 33.92, P < 0.001$). The levels of hazardous and harmful alcohol consumption detected by the AUDIT scores for men and women were higher than those reported in the general population (Degenhardt *et al.*, 2000), however they are consistent with other studies, which point to a higher incidence of heavy drinking amongst users of Emergency Departments in Australia (Hulse *et al.*, 2001; Roche *et al.*, 2001; Stockwell *et al.*, 2002).

More females than males reported zero tobacco consumption, but among those who did smoke, it was more often males who reported moderate or heavy consumption ($\chi^2 (3) = 7.75, P = 0.052$). Again, levels of tobacco consumption reported by participants in this study are higher than those detected in the Australian general population (Australian Institute of Health and Welfare, 2002), however they do reflect the higher incidence of smoking often reported amongst Emergency Department presentations (Richman *et al.*, 1999; Horn *et al.*, 2000, 2002).

Table 1. Gender by socio-demographic characteristics of sample

	Males (<i>n</i> = 452)	Females (<i>n</i> = 360)	Full sample (<i>n</i> = 812)
Age (mean years)	40.88	39.15	40.11
Australian resident (%)	95	94	95
Indigenous (%)	3	3	3
Marital status (%)			
Single	45	36	41
Married/ <i>de facto</i>	42	43	42
Separated/divorced/widowed	13	21	17
Main source of income (%)			
Full-time work	45	26	37
Part-time/casual work	14	22	17
Dole or pension	29	25	27
Home duties	1	13	6
Other	12	14	13
Highest level of education completed (%)			
Primary	9	9	9
Year 10	34	40	37
Year 12	22	25	24
TAFE or trade	22	16	19
University	12	10	11
Total annual household income (%)			
\$0 – \$20,000	38	49	43
\$20 000 – \$40 000	32	32	32
\$40 000 or more	30	19	25
Private health insurance (%)	14	12	13

Table 2. Gender of respondents by AUDIT score, tobacco use, anxiety and depression

	Males (n = 452)	Females (n = 360)	Full sample (n = 812)
AUDIT score*** (%)			
Non-drinker	14.5	24.0	18.7
Non-hazardous	46.8	55.8	50.8
Hazardous	26.7	13.6	20.9
Harmful	12.0	6.6	9.6
Tobacco consumption (%)			
Non-smoker	55.5	62.8	58.7
Light smoker	7.5	8.9	8.1
Moderate smoker	16.8	14.7	15.9
Heavy smoker	20.1	13.6	17.2
HADS anxiety score* (%)			
Normal	72.2	63.1	68.2
Doubtful case	11.7	16.5	13.8
Definite case	16.1	20.4	18.0
HADS depression score (%)			
Normal	85.9	90.5	87.9
Doubtful case	7.2	5.6	6.5
Definite case	7.0	3.9	5.6

* $P < 0.05$; *** $P < 0.001$.

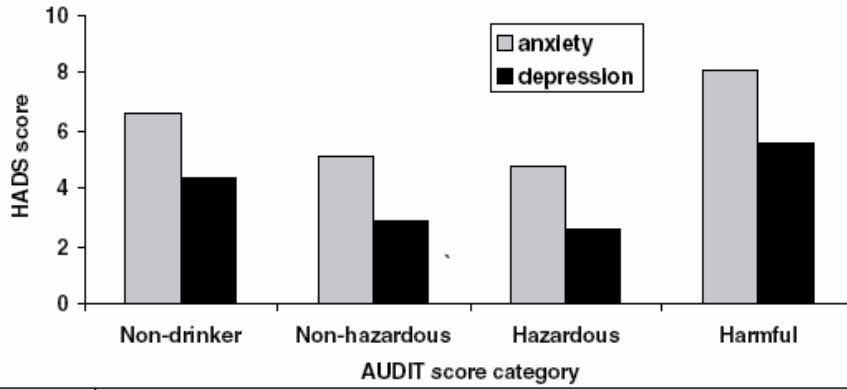
Females more often reported borderline or clinical levels of anxiety ($\chi^2 (2) = 7.73$, $P < 0.05$). The levels of anxiety in this sample were higher than those in the general population (9.7%) and were greater amongst women than men (20.4% vs 16.1%). This gender difference is consistent, although to a much higher degree, with the higher levels of female anxiety in the general population (12.1% vs 7.1%) (Henderson *et al.*, 2000).

The prevalence of depression in this Emergency Department (5.6%) was similar to that of the Australian general population (5.8%), but there was a higher incidence of depression among men (7.0%) than among women (3.9%).

Although there was no significant association between gender and depression ($\chi^2 (2) = 4.54$, $P > 0.05$), the higher prevalence of depression amongst men is not consistent with national trends, where women report higher rates of depression (12%) than men (4.2%) (Henderson *et al.*, 2000).

In order to investigate the relationship between (i) alcohol use and mental health, and (ii) tobacco use and mental health, eight one-way analyses of covariance (ANCOVA) were conducted, controlling for age, income, education and triage code, and conducted separately for male and female participants. The results of these analyses are presented below and illustrated in Figs 1–4.

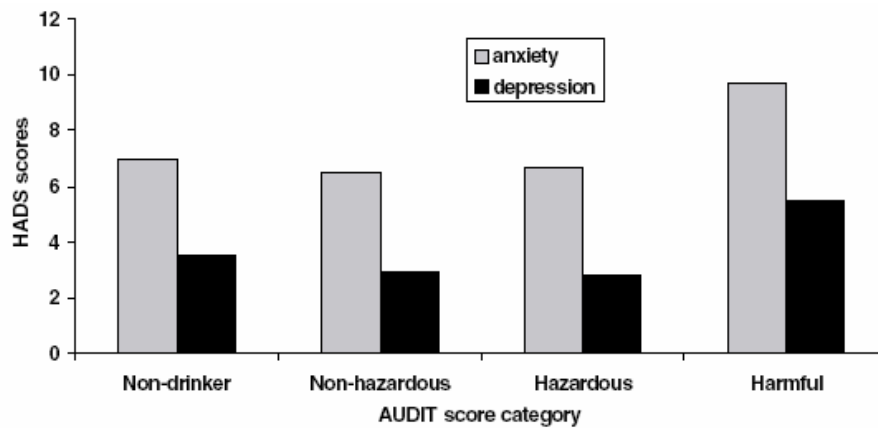
Among males, anxiety scores differed significantly depending on AUDIT score, $F(3,394) = 8.64$, $P < 0.001$. Those in the harmful drinking category reported significantly more anxiety than those in other categories, $F(1,394) = 15.43$, $P < 0.001$, however non-drinkers also reported significantly more anxiety than either non-hazardous or hazardous drinkers, $F(1,394) = 6.61$, $P < 0.05$. There was no significant difference in the anxiety scores of non-hazardous and hazardous male drinkers, $F(1,394) = 0.24$, $P > 0.05$. Thus, for males the relationship between anxiety and alcohol consumption was described by a 'U-shaped curve', consistent with previous findings (Power *et al.*, 1998; Rodgers *et al.*, 2000b).



Mean (95% CI)				
Anxiety	6.6 (5.5 – 7.7)	5.1 (4.5 – 5.7)	4.8 (4.0 – 5.7)	8.1 (6.9 – 9.4)
Depression	4.4 (3.6 – 5.3)	2.9 (2.4 – 3.3)	2.6 (2.0 – 3.3)	5.6 (4.6 – 6.5)

Note: Means have been corrected for age, income, education and triage code.

Fig. 1. HADS anxiety and depression scores as a function of AUDIT score category, for males.



Mean (95% CI)				
Anxiety	7.0 (6.0 – 8.0)	6.5 (5.8 – 7.1)	6.7 (5.4 – 8.1)	9.7 (7.8 – 11.6)
Depression	3.5 (2.7 – 4.2)	2.9 (2.4 – 3.4)	2.8 (1.8 – 3.8)	5.5 (4.1 – 6.9)

Note: Means have been corrected for age, income, education and triage code.

Fig. 2. HADS anxiety and depression scores as a function of AUDIT score category, for females.

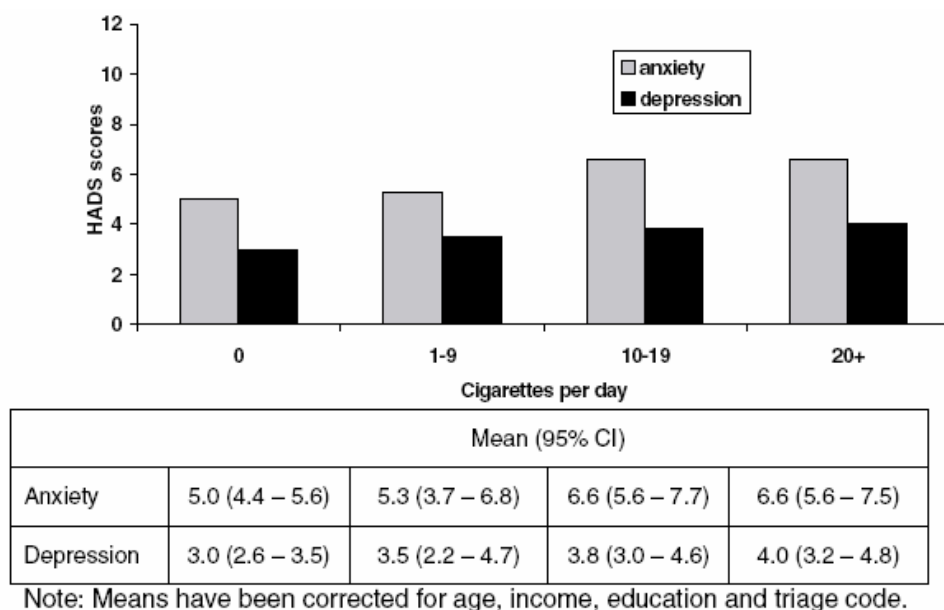


Fig. 3. HADS anxiety and depression scores as a function of tobacco consumption, for males.

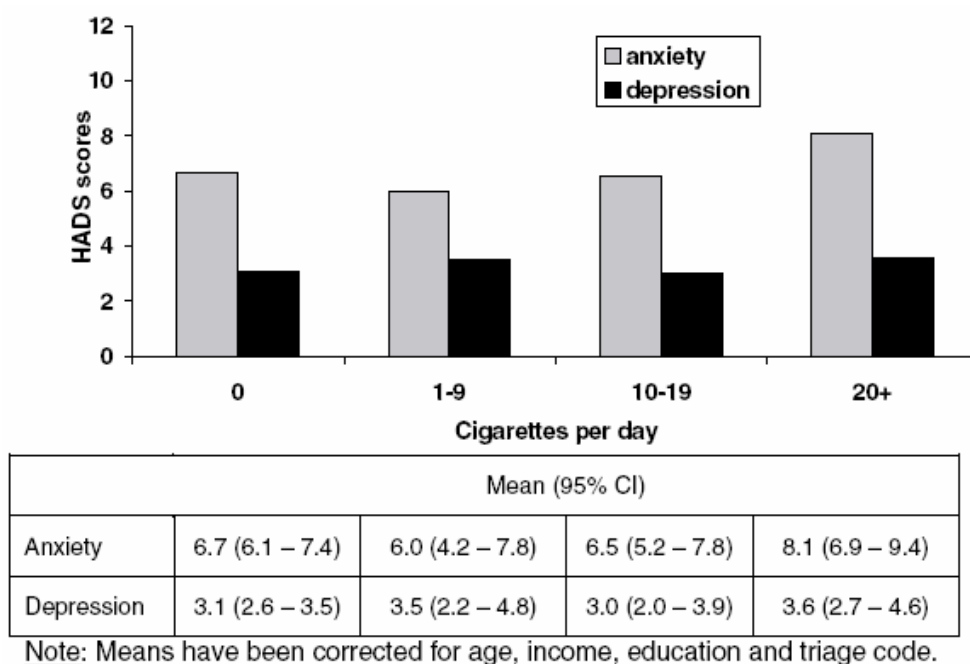


Fig. 4. HADS anxiety and depression scores as a function of tobacco consumption, for females.

Similarly, there was a significant association between AUDIT category and HADS depression score among males, $F(3,394) = 11.89, P < 0.001$. Depression scores were higher in the harmful drinking category than in any other, $F(1,394) = 18.28, P < 0.001$, and higher in the non-drinking category than in either the non-hazardous or hazardous categories, $F(1,394) = 11.75, P < 0.01$. Non-hazardous and hazardous male drinkers did not differ in their depression scores, $F(1,394) = 0.24, P > 0.05$. Again, this pattern of results is consistent with the U-shaped curve, as illustrated in Fig. 1, and with previous studies (Power *et al.*, 1998; Rodgers *et al.*, 2000b).

Among females there was a significant association between AUDIT category and HADS anxiety score, $F(3,306) = 3.32, P < 0.05$. Females in the harmful drinking category reported significantly more anxiety than those in other categories [$F(1,306) = 8.40, P < 0.01$], however there was no significant

difference between non-drinking females and those in the non-hazardous and hazardous categories, $F(1,306) = 0.38$, $P > 0.05$. Similarly, non-hazardous and hazardous female drinkers did not differ in their anxiety scores, $F(1,306) = 0.13$, $P > 0.05$. Thus, whereas for males the relationship between anxiety and alcohol consumption was described by a 'U-shaped curve', this was not the case for females.

A similar pattern described the association between alcohol consumption and depression for females, with those in different AUDIT categories receiving significantly different depression scores, $F(3,306) = 4.60$, $P < 0.01$. Females in the harmful drinking category reported more depression than those in other categories, $F(1,306) = 11.32$, $P < 0.01$, however there was no difference between either non-drinkers and non-hazardous or hazardous female drinkers, $F(1,306) = 1.63$, $P > 0.05$, or between non-hazardous and hazardous female drinkers, $F(1,306) = 0.06$, $P > 0.05$.

Among males, HADS anxiety score varied as a function of tobacco consumption, $F(3,408) = 3.80$, $P < 0.05$. Non-smoking males reported significantly less anxiety than those who did smoke, $F(1,408) = 5.78$, $P < 0.05$, however, levels of anxiety did not differ between light smokers and moderate or heavy smokers, $F(1,408) = 2.32$, $P > 0.05$, or between moderate and heavy smokers, $F(1,408) = 0.01$, $P > 0.05$.

By contrast, controlling for age, education, income and triage code, there was no association between HADS depression score and tobacco consumption among males $F(3,408) = 1.83$, $P > 0.05$ (Fig. 3).

Finally, whereas male non-smokers reported significantly less anxiety than those who did smoke, among females there was no relationship between HADS anxiety score and tobacco consumption [$F(3,315) = 1.69$, $P > 0.05$], and no relationship between HADS depression score and tobacco consumption [$F(3,315) = 0.49$, $P > 0.05$].

The same analyses were also run using only age as a covariate, and then adding the additional covariates (education, income, triage code) one at a time (tables not presented). The results of these additional analyses did not differ substantively from those presented here.

DISCUSSION

Findings from this study support previous evidence describing a nonlinear ('U-shaped') relationship between alcohol consumption and mental health among males (Power *et al.*, 1998; Rodgers *et al.*, 2000b). Our findings also suggest that the association between alcohol consumption and improved mental health among males may extend to levels of drinking labelled as 'hazardous' from a public health perspective. This runs counter to previous studies, which have found that symptoms of anxiety and depression are lower only amongst so-called 'moderate' drinkers (Rodgers *et al.*, 2000a,b; Degenhardt and Hall, 2003).

In our sample the relationship between mental health and alcohol consumption was linear for females, despite a non-significant trend towards a 'U-shaped' relationship. This finding is inconsistent with previous studies (Degenhardt *et al.*, 2000; Rodgers *et al.*, 2000b) and brings into question the association between moderate alcohol consumption and better mental health among women. The finding is, however, consistent with the mortality literature, where this gender difference has been noted (Smith-Warner *et al.*, 1998; Bovet and Paccaud, 2001). Although women's moderate consumption of alcohol is associated with positive health outcomes in relation to some diseases, it appears that the same consumption may be related to greater mortality with respect to other diseases (Smith-Warner *et al.*, 1998; Bovet and Paccaud, 2001). Our findings suggest that this gender difference may extend to the area of mental health.

Population data point to a linear association between symptoms of anxiety and depression and smoking status (Australian Bureau of Statistics, 1998; World Health Organization, 2002). Findings from this study suggest that the same is true amongst patients presenting to an Emergency Department in Australia, although again only for males, and perhaps only with respect to anxiety. The apparent lack of association between tobacco consumption and mental health among females in our study raises questions about the link between smoking, anxiety and depression in women.

The present study has some notable limitations. First, while the study population is likely to be reasonably representative of Emergency Department patients, it is unclear to what extent the present findings can be generalized to the wider population. The demographic characteristics of this sample suggest an over-representation of people from lower socio-economic status groups, who consume tobacco and alcohol at higher rates than the Australian general population and experience a higher prevalence of some mental health problems (World Health Organization, 2002). Second, the screening tool used to assess mental health status (the HADS) is designed to detect clinically significant pathology—as such, it may underestimate the prevalence of less severe symptoms of anxiety and

depression. Similar considerations apply to the AUDIT questionnaire, which may be more suited to detecting problematic use than lower levels of use. As with the HADS, the AUDIT is a self-report screening tool, and is, therefore, constrained by the truthfulness of the respondents' reports and the limitations of their memory. Finally, the HADS assesses state rather than trait anxiety and depression. Arguably, responses may be affected by the nature and severity of the respondent's clinical presentation. However, adjustment for urgency of case at presentation (triage code) did not appear to alter the nature of the associations between alcohol use and mental health status, suggesting that our results are unlikely to be biased by the severity of participants' clinical conditions.

Notwithstanding these limitations, the study has a number of strengths. Although not representative of the general Australian population, this sample represents well those presenting to public hospital Emergency Departments in Australia. It is also likely to be representative of individuals from low socio-economic status backgrounds, who tend to smoke and drink more heavily and experience a higher incidence of mental health problems, particularly anxiety and depression (World Health Organization, 2002; Claussen *et al.*, 2003). Also, despite the use of screening instruments to measure alcohol consumption and mental health status, the observed patterns of nonlinear association between alcohol consumption and anxiety and depression are not dissimilar to those identified in other community surveys, at least as far as males are concerned (Degenhardt *et al.*, 2000; Rodgers *et al.*, 2000*a,b*). This is an important finding, as it has been replicated in a setting which lends itself to the application of intervention strategies.

CONCLUSIONS

This study directs attention to possible gender differences in patterns of association between alcohol and tobacco consumption and anxiety and depression. Among males, the observed relationship between alcohol consumption and mental health was non-linear, while for females it was linear. In addition, tobacco consumption was associated with greater anxiety among males, but not females. This study reiterates the need for further research attention to the mental health needs of non-drinkers, and to exploration of the differential relationship between alcohol use, tobacco use and mental health amongst males and females.

REFERENCES

- ACEM (2004) Guidelines for Implementation of the Australasian Triage Scale in Emergency Departments. Australasian College of Emergency Medicine.
- Australian Bureau of Statistics (1998) *Mental Health and Wellbeing: Profile of Adults, Australia 1997*. ABS, Canberra.
- Australian Institute of Health and Welfare (2002) *2001 National Drug Strategy Household Survey: Detailed Findings*. AIHW cat no PHE 41. (Drug Statistics Series No. 11), Canberra.
- Babor, T. F., De La Fuente, J. R., Saunders, J. and Grant, M. (1992) *AUDIT — The Alcohol Use Disorders Identification Test: Guidelines for Use in Primary Health Care*. World Health Organization, Geneva.
- Barnett, N. P., Monti, P. M., Spirito, A., Colby, S. M., Rohsenow, D. J., Ruffolo, L. and Woolard, R. (2003) Alcohol use and related harm among older adolescents treated in an emergency department: The importance of alcohol status and college status. *Journal of Studies on Alcohol* 64, 342–349.
- Bovet, P. and Paccaud, F. (2001) Commentary: Alcohol, coronary heart disease and public health: which evidence-based policy. *International Journal of Epidemiology* 30, 734–737.
- Caldwell, T. M., Rodgers, B., Jorm, A. F., Christensen, H., Jacomb, P. A., Korten, A. E. and Lynskey, M. T. (2002) Patterns of association between alcohol consumption and symptoms of depression and anxiety in young adults. *Addiction* 97, 583–594.
- Cassar, S., Hodgkiss, A., Ramirez, A. and Williams, D. (2002) Mental health presentations to an inner-city accident and emergency department. *Psychiatric Bulletin* 26, 134–136.
- Claussen, B., Davey Smith, G. and Thelle, D. (2003) Impact of childhood and adulthood socioeconomic position on cause specific mortality: the Oslo Mortality Study. *Journal of Epidemiology and Community Health* 57, 40–45.
- Degenhardt, L. and Hall, W. (2001) The relationship between tobacco use, substance-use disorders and mental health: results from the National Survey of Mental Health and Well-being. *Nicotine and Tobacco Research: Journal of the Society for Research on Nicotine and Tobacco* 3, 225–234.
- Degenhardt, L. and Hall, W. (2003) Patterns of co-morbidity between alcohol use and other substance use in the Australian population. *Drug and Alcohol Review* 22, 7–13.
- Degenhardt, L., Hall, W. and Lynskey, M. (2001) Alcohol, cannabis and tobacco use among Australians: a comparison of their associations with other drug use and use disorders, affective and anxiety disorders, and psychosis. *Addiction* 96, 1603–1614.
- Degenhardt, L., Hall, W., Teesson, M. and Michael, L. (2000) *Alcohol Use and Disorders in Australia: Findings from*

- the National Survey of Mental Health and Wellbeing*, Report 97. National Drug and Alcohol Research Centre, Sydney.
- Ezzati, M., Lopez, A. D., Rodgers, A., Vander Orn, S. and Murray, C. J. L. (2002) The Comparative Risk Assessment Group: Selected major risk factors and global and regional burden of disease. *Lancet* 360, 1347–1360.
- Goldman, E. and Najman, J. M. (1984) Lifetime abstainers, current abstainers and imbibers: a methodological note. *The British Journal of Addiction* 79, 309–314.
- Henderson, S., Andrews, G. and Hall, W. (2000) Australia's mental health: an overview of the general population survey. *Australian and New Zealand Journal of Psychiatry* 34, 197–205.
- Horn, K., Gao, X., Williams, J., Helmkamp, J., Furbee, M. and Manley, W. (2000) Conjoint smoking and drinking: a case for dual-substance intervention among young emergency department patients. *Academic Emergency Medicine* 7, 1126–1134.
- Horn, K., Leontieva, L., Williams, J. M., Furbee, P. M., Helmkamp, J. C. and Manley, W. G. 3rd (2002) Alcohol problems among young adult emergency department patients: making predictions using routine sociodemographic information. *Journal of Critical Care* 17, 212–220.
- Hulse, G. K., Robertson, S. I. and Tait, R. J. (2001) Adolescent emergency department presentations with alcohol- or other drug-related problems in Perth, Western Australia. *Addiction* 96, 1059–1067.
- Jorm, A. F., Rodgers, B., Jacomb, P. A., Christensen, H., Henderson, S. and Korten, A. E. (1999) Smoking and mental health: results from a community survey. *Medical Journal of Australia* 170, 74–77.
- National Health and Medical Research Council (2001) *Australian alcohol guidelines: health risks and benefits*. National Health and Medical Research Council, Canberra.
- Power, C., Rodgers, B. and Hope, S. (1998) U-shaped relation for alcohol consumption and health in early adulthood and implications for mortality. *Lancet* 352, 877.
- Richman, P. B., Dinowitz, S., Nashed, A., Eskin, B. and Cody, R. (1999) Prevalence of smokers and nicotine-addicted patients in a suburban emergency department. *Academic Emergency Medicine* 6, 807–810.
- Roche, A. M., Watt, K., McClure, R., Purdie, D. M. and Green, D. (2001) Injury and alcohol: A hospital emergency department study. *Drug and Alcohol Review* 20, 155–166.
- Rockett, I. R., Putnam, S. L., Jia, H. and Smith, G. S. (2003) Assessing substance abuse treatment need: a statewide hospital emergency department study. *Annals of Emergency Medicine* 41, 802–813.
- Rodgers, B., Korten, A. E., Jorm, A. F., Christensen, H., Henderson, S. and Jacomb, P. A. (2000a) Risk factors for depression and anxiety in abstainers, moderate drinkers and heavy drinkers. *Addiction* 95, 1833–1845.
- Rodgers, B., Korten, A. E., Jorm, A. F., Jacomb, P. A., Christensen, H. and Henderson, A. S. (2000b) Non-linear relationships in associations of depression and anxiety with alcohol use. *Psychological Medicine* 30, 421–432.
- Smith-Warner, S. A., Spiegelman, D., Yaun, S. S. *et al.* (1998) Alcohol and breast cancer in women: a pooled analysis of cohort studies. *Journal of the American Medical Association (JAMA)* 279, 535–540.
- Spirito, A., Barnett, N. P., Lewander, W., Colby, S. M., Rohsenow, D. J., Eaton, C. A. and Monti, P. M. (2001) Risks associated with alcohol-positive status among adolescents in the emergency department: a matched case-control study. *Journal of Pediatrics* 139, 694–699.
- Stockwell, T., McLeod, R., Stevens, M., Phillips, M., Webb, M. and Jelinek, G. (2002) Alcohol consumption, setting, gender and activity as predictors of injury: a population-based case-control study. *Journal of Studies on Alcohol* 63, 372–379.
- Tait, R. J., Hulse, G. K., Robertson, S. I. and Sprivilis, P. (2002) Multiple hospital presentations by adolescents who use alcohol or other drugs. *Addiction* 97, 1269–1275.
- Woolfenden, S., Dossetor, D. and Williams, K. (2002) Children and adolescents with acute alcohol intoxication/self-poisoning presenting to the emergency department. *Archives of Pediatrics and Adolescent Medicine* 156, 345–348.
- World Health Organization (2002) *The world health report 2002: reducing risks, promoting healthy life*. World Health Organization, Geneva.
- Zigmond, A. and Snaith, P. (1983) The Hospital Anxiety and Depression Scale. *Acta Psychiatrica Scandinavica* 67, 361–370.