THE PREVALENCE AND CORRELATES OF HAZARDOUS DRINKING IN INDUSTRIAL WORKERS: A STUDY FROM GOA, INDIA

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Abstract — **Aims:** This study aimed to describe the prevalence and associations of hazardous drinking in a male industrial worker population in India. **Methods:** A total of 984 subjects from a randomly selected sample of 1013 workers from four industries in Goa, India, were recruited. Interviews included the 10-item Alcohol Use Disorders Identification Test (AUDIT) as an indicator of hazardous drinking and the 12-item General Health Questionnaire (GHQ12) as a measure of common mental disorders (CMDs). **Results:** The prevalence of hazardous drinking, defined as an AUDIT score of more than 8 was 21%. There was a significant association with CMD (OR 2, P = 0.003). Hazardous drinking was significantly associated with severe health problems, such as head injuries and hospitalization whereas CMD was found to be a confounder in its association with adverse economic outcomes. **Conclusions:** Hazardous drinking is common among male industrial workers in Goa. Interventions in the workplace must target both drinking problems and CMDs, since they often co-exist and are associated with different types of adverse outcomes.

INTRODUCTION

Hazardous drinking is a level of alcohol consumption which could prove harmful in the future (Edwards *et al.*, 1981). This concept is important because it describes a population with early alcohol-related problems, which appears to be a suitable target for delivering brief, preventive interventions (Moyer *et al.*, 2002). Surveys have been conducted in developed nations on the rates of hazardous drinking in working populations (Davey *et al.*, 2000; Hermansson *et al.*, 2000), using the World Health Organization (WHO) developed instrument — Alcohol Use Disorders Identification Test (AUDIT) (Saunders *et al.*, 1993*a*). However, there is little epidemiological research on hazardous drinking in the general population in Asian populations. One exception is the study by Assanangkornchai *et al.* (2000).

Hazardous drinking becomes especially important in the workplace, because the impact of the disability produced by it is likely to be greater given the occupational role of the subject. Secondly, because of the employment setting, interventions delivered through the workplace are a feasible preventive strategy. Thirdly, although there are no data on hazardous drinking in the workplace in India, there are studies documenting a high prevalence of drinking in this population (Gangrade and Gupta, 1978; Gargi and Goyal, 1992). Hence, we decided to examine the prevalence of hazardous drinking in the workplace. Only males were selected, as studies in India show that the prevalence of drinking among females is minimal (Singh, 1989). This study was the first stage of a larger project investigating the impact of hazardous drinking in the workplace. In this study, we chose a screening instrument, the AUDIT, to indicate persons with levels of drinking that are hazardous. Thus, in this paper, when we use the term hazardous drinking, we refer to subjects who score 8 or more on the AUDIT.

The second aim of the study was to describe the correlates of hazardous drinking, in particular the co-morbidity with common mental disorders (CMDs) and their contribution to health and economic difficulties faced by subjects.

SUBJECTS AND METHODS

This was a cross-sectional survey, set in Goa, a state on the west coast of India with a population of 1.35 million (Census of India, 2001). Goa has one of the highest per capita incomes and literacy rates in India. Most of the population is Hindu (70%), the rest being mostly Catholic (27%). Alcoholic drinks are easily available here at cheaper rates than neighbouring states, due to lower excise duties (Patel *et al.*, 2001). The main industries in Goa are mining, ship-building, tourism, pharmaceuticals and agrochemicals.

Study population

Four large (>150 male workers) industries were selected from a list of all large industries registered in the state to represent the four major sectors of industry found in Goa, a private sector mining industry, a public sector shipyard, a state bus transport company and a private sector fertilizer industry.

Sampling

A total of 1013 male subjects were selected using systematic random sampling selecting every second and fifth employee from the employee lists of these four factories (total subject population of 2500).

Interviews

A semi-structured interview for socio-demographic, economic and health data, used in earlier studies in Goa (Patel *et al.*, 1998*a*), was used. Economic data included monthly income, number of earning members, subjective report of ability to meet needs with income, outstanding loans, and hunger in the past month due to money problems. Health-related data included history of head injury or bone fracture after the age

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of 18 years, absenteeism in the past month, meeting a doctor in the past 3 months, admission to a hospital in the past year and injury during work hours.

In addition, the following two questionnaires were administered as interviews: The AUDIT is a 10-item screening questionnaire developed by the WHO for the detection of hazardous drinking (Saunders *et al.*, 1993*b*). It has been validated and used in cross-national studies including India (Babu and Sengupta, 1997). The WHO prescribes a cut-off of 8 on the AUDIT for detecting hazardous drinking (Saunders *et al.*, 1993*b*). Details regarding local beverages and their gram equivalents of alcohol are provided in Appendix 1. The second questionnaire, the GHQ12 (Goldberg and Williams, 1988), is a screen for anxiety and depressive symptomatology or what is termed in the literature as common mental disorders (CMDs). A cut-off of 4 on the GHQ has been shown to be having optimal sensitivity and specificity for detecting CMDs in the primary care population in Goa (Patel *et al.*, 1998*b*)

The AUDIT was translated into Konkani (the language of common usage in Goa), using the translation-back translation method with two teams of translators followed by an item-by-item analysis and selection by consensus. The validity of the Konkani version of the GHQ has been demonstrated in earlier studies conducted in Goa (Patel *et al.*, 1998*b*).

A pilot study was carried out in one of the selected industries to determine whether the translated questionnaire was clearly understood and was identifying the same constructs as the English version. The translation team included three doctors, two social scientists and one clinical psychologist.

Interview procedure

Key informants in each industry approached the subjects on the sampled list and recruited them for the interview. Researchers were trained in administering the interview protocols in role-play and in piloting in a factory where inter-rater reliability checks were also completed. In the actual study, the interviews were administered in a private setting at the workplace after obtaining informed verbal consent from the respondent. The interview was conducted in English or Konkani as per the preference of the subject. An effort at maximizing reliability of collected information was made, by informing workers about the confidentiality of information volunteered and by enlisting the help of worker representatives to build worker confidence. At no point was the management involved in the collection or examination of individual subject data. The doctors in the study gave those subjects who scored high on the AUDIT or GHQ basic health advice and information regarding specialist care.

Data analysis

Data were coded numerically at the time of the interview and later entered into a spreadsheet by keyboard entry. Analyses were done with SPSS software for Windows (version 8.0) as follows:

Prevalence of hazardous drinking. This was estimated as the proportion of subjects scoring 8 or more on the AUDIT.

Correlates of hazardous drinking: The associations of hazardous drinking with socio-demographic variables were examined. The GHQ12 score was categorized into 'case' or 'noncase' on the basis of a cut-off score of 4. Odds ratios with 95% confidence intervals were calculated for the univariate

association of hazardous drinking with health and economic variables. Hazardous drinking, defined as a score of ≥8 on the AUDIT, was a dependent variable in the model. Because there was significant co-morbidity with CMD, multivariate analyses including CMD in a logistic regression model were carried out. All significance tests were two-tailed.

RESULTS

Sample

Of the 1013 subjects selected, 984 completed the study (97%); 29 (3%) refused or were unable to have an interview because of chronic absenteeism. The average age ($\pm$ SD) was 41.7 $\pm$ 7.9 years (range = 20–60 years). Subjects had been employed in the specific industry for an average of 17.5 $\pm$ 7.2 years (range = 1–40 years). The majority (76%, $n = 746$) were Hindu and the rest were mostly Catholic (21%, $n = 209$). Most of the subjects (91%, $n = 896$) had completed at least 4 years of school and a third (31%, $n = 306$) had completed a technical diploma or had been to college. A total of 91% ($n = 894$) of the subjects were married and these subjects had an average ($\pm$ SD) of 2 $\pm$ 1.2 children (range = 0–7). The monthly income of the subjects averaged 7493 $\pm$ 2673.8 rupees (range = 950–25 000). A total of 74% ($n = 724$) of the subjects were the sole bread-winners of the family.

Prevalence and correlates of hazardous drinking

The mean AUDIT score ($\pm$ SD) was 4.4 $\pm$ 5.5 (range = 0–39); 68.6% ($n = 675$) were drinking and 31.4% ($n = 3$ 09) were abstinent in the past year. The prevalence of hazardous drinking, using a cut-off of 8 on the AUDIT in the total population, was 21.3% ($n = 210$). Among all drinkers, 31.1% were 'hazardous drinkers' in the past year. The mean AUDIT score among the hazardous drinkers was 12.8 $\pm$ 5.96 (range = 8–39). The pattern of drinking and problems elicited by the AUDIT in the hazardous drinkers and others are shown in Table 1.

Hazardous drinkers were more likely to be Catholic (29 vs 20%; OR 1.3, CI 1.1–1.5, $P = 0.005$) and to not have completed school (54 vs 38%; OR 1.9, CI 1.4–2.6, $P < 0.001$). Hazardous drinkers were significantly more likely to have an earlier age of onset of drinking (mean $\pm$ SE: 21.6 $\pm$ 0.3 vs 23.7 $\pm$ 0.2; $t = 4.4$, df = 801, $P < 0.001$), to perceive their drinking as a problem (21 vs 2%; OR 14.2, CI 7.6–26.6, $P < 0.001$) and to seek help for their drinking (14 vs 4%; OR 4, CI 2.4–6.9, $P < 0.001$).

There was a strong association between GHQ scores and hazardous drinking; 16% of hazardous drinkers were also suffering from a CMD as compared with 9% in other men (OR 2, CI 1.3–3.1, $P < 0.003$). Table 2 shows the association of being a hazardous drinker with health, work and economic outcomes in univariate and multivariate analyses after adjustment for CMD. Hazardous drinking was found to be significantly associated with head injuries and hospitalization.

DISCUSSION

This paper describes a survey of hazardous drinking in a representative randomly drawn sample of male industrial

Table 1. Patterns of alcohol consumption

Selected items from AUDIT	Percentage of hazardous drinkers ($n = 210$)	Percentage of other subjects ($n = 773$)
Drinks at least two to three times a week	78.2	13.3
Drinks at least five drinks on typical drinking day	62.3	13
Drinks six or more drinks on one occasion at least once a week	54.1	1.4
Is unable to stop drinking once started at least once a week	8	0
Needed an early morning drink at least once a week	2.9	0
Unable to remember what happened on a drinking occasion at least once a week	4.8	0
Been injured/injured someone else during the past year	4.8	0
Doctor or friend or relative concerned or suggested to cut down drinking in the past year	60.8	1

Table 2. Correlates of hazardous drinking and common mental disorders (CMDs)

Variable with CMD	Percentage of sample experiencing	Univariate association with hazardous drinking	Associations adjusted for co-morbidity
Hunger in the past month due to money problems	19	1.4, 1.01–2.1, 0.04	1.3, 0.9–1.9, 0.1
Being unable to meet daily needs	24	1.06, 0.7–1.5, 0.7	0.97, 0.7–1.4, 0.8
Visited a doctor in the previous 3 months	46	0.98, 0.7–1.3, 0.9	0.9, 0.7–1.2, 0.5
Fracture since the age of 18 years	12	1.1, 0.7–1.7, 0.5	1, 0.7–1.7, 0.7
Head injury after the age of 18 years	10	2.9, 1.9–4.6, <0.001	2.9, 1.8–4.5, <0.001
Hospital admission in the previous year	8	1.8, 1.1–2.9, 0.01	1.7, 1.04–2.8, 0.03
Injury at work in duration of employment	19	1.1, 0.7–1.6, 0.5	1.1, 0.7–1.7, 0.6
Absent from work without notice in the past month	13	1.1, 0.7–1.8, 0.5	1, 0.7–1.5, 0.8

Odds ratios, with confidence intervals and significance, of certain health and socio-economic problems, for hazardous drinking, and for hazardous drinking after adjustment for CMDs using multivariate logistic regression analyses.

workers in India. The key findings of the study were that hazardous drinking was common, with a fifth of all male industrial workers being hazardous drinkers. Hazardous drinking was associated with an earlier age of onset of drinking, lower education and being Catholic. While hazardous drinkers were significantly more likely to recognize that they had a drinking problem, only a small proportion (14%) had sought help for their problem. Hazardous drinkers were significantly more likely to be suffering from a CMD or having an adverse health outcome, such as hospital admissions.

We used the AUDIT to identify the hazardous drinking group. The AUDIT was designed for use in healthcare settings, but has been successfully applied in wider population samples (Reinert and Allen, 2002). Importantly, it was designed as a screening, not a diagnostic tool. However, recent research has confirmed that the instrument (scored as ≥ 8) has reasonable sensitivity and specificity for identifying hazardous drinkers (Reinert and Allen, 2002). For example, screening emergency room attenders (Cherpitel, 1997) and primary care attenders (Volk et al., 1997), the AUDIT, at a cut-off score of 8, identified at-risk drinking and alcohol dependence, with ROC areas ranging from 0.89 to 0.93. Similar studies on the validity of AUDIT in Asian populations have found high rates of sensitivity for the translated versions of the AUDIT. For example, Lapham et al. (1999) reported a sensitivity of 0.89 for an alcohol-related diagnosis in Thai emergency room patients. Leung and Arthur (1999) have studied the internal consistency and construct validity of a modified version (to account for local drinking practices) of the AUDIT in Hong Kong, and found it to have high internal consistency (alpha coefficient 0.96). Thus, while the AUDIT may not be considered a diagnostic measure of different types

of alcohol-related disorders, it can be considered a valid indicator of persons with hazardous drinking and alcohol-related problems (Reinert and Allen, 2002).

There are sparse data on hazardous drinking in an Asian context. Lapham et al. (1998) reported the prevalence of alcohol-related problems to be 39% among men and 8% among women attending the emergency rooms in three regional hospitals in Thailand. Leung and Arthur (1999) in a study of 450 subjects found a prevalence of AUDIT ≥ 8 to be 6.2% among community subjects and 14.5% among hospital attenders in Hong Kong. There is no literature on hazardous drinking in industrial workers in India. The available literature for both the general population and industrial workers shows high rates of abstinence (50% and above); however, the proportion of drinkers who drink heavily or get drunk is high (Singh, 1989). This is in accordance with a temperance culture prevailing in most parts of the country. In the present study, we found that there were lower rates of abstinence than those reported from elsewhere in India. Amongst those who drank alcohol, nearly one third were hazardous drinkers. While there is no systematic evidence linking the prevalence of hazardous drinking in a population with the levels of abstinence, there is anecdotal evidence (V. Benegal and R. S. Murthy, personal communication) that, in most parts of India, where there is a temperance culture towards alcohol, there are high rates of abstinence, but the proportion of drinkers who drink at hazardous levels is high. Goa is known for a more liberal, 'wet' culture towards drinking and this is reflected in the lower abstinence rates. However, despite the latter, it is worrying that a high proportion of drinkers are drinking at hazardous levels.

This study has demonstrated a significant degree of co-morbidity between CMD and hazardous drinking, similar

to that reported by other authors (Grant and Harford, 1995; Lynskey, 1998; Hickie *et al.*, 2001). As a result of high levels of co-morbidity with CMD, multivariate analyses of the associations between hazardous drinking and other independent variables were conducted after adjustment for CMD. These analyses showed that hazardous drinking was strongly associated with serious head injuries and hospital admissions, but not with fractures of limbs, consultation with doctors or economic difficulties. Going hungry in the past month was significantly associated with being a hazardous drinker. However, after adjusting for the effect of co-morbidity of CMD in hazardous drinkers, this association was no longer significant. This suggests that CMDs are an important modifier of the association of poor economic status with hazardous drinking. This would be in line with earlier studies from Goa showing a strong association between economic difficulties and CMDs (Patel *et al.*, 1998*a*). The precise direction of causality cannot be ascertained from a cross-sectional survey; it is plausible that hazardous drinkers who become depressed are more likely to be absent from work, which may lead to loss of income and a deteriorating economic situation. Conversely, hazardous drinking may be associated with loss of income, which acts as a stressful life event leading to depression.

Studies in India have shown a high prevalence for alcohol-related disability in the past two decades (Murthy, 1992) and the results from our study support this finding. Thus, hazardous drinking was mainly associated with severe health outcomes, such as head injuries and hospitalization. The correlation of hazardous drinking with head injury after the age of 18 years probably reflects the association of road traffic accidents with alcohol consumption often reported in the literature (Bohning and Na-Ayuthaya, 1997; Odero *et al.*, 1997; Singh and Roy, 1997). This study suggests that persons with hazardous drinking come in contact with the health system only as a result of severe medical problems (such as head injuries), which require hospital admission.

In conclusion, this study highlights the moderate prevalence of hazardous drinking in a population of male industrial workers and their association with adverse health outcomes. The adverse impact on economic outcomes was associated with the co-morbidity of CMDs. Thus, interventions for hazardous drinking in industries must also focus on CMDs. The implications of the study are obvious: programmes aimed at reducing hazardous drinking are essential in industries. There is some evidence that hazardous drinkers can be effectively treated with simple brief interventions (Heather *et al.*, 1987; Wallace *et al.*, 1988; Anderson and Scott, 1992). Interventions must also target any co-morbid CMDs. Further research will need to examine the specific type of psychiatric co-morbidity, the economic and social impact of hazardous drinking and its impact on families.

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APPENDIX 1. THE CONVERSION OF REPORTED CONSUMPTION OF BEVERAGES TO ALCOHOLIC DRINKS

One standard drink = 10 g of alcohol.

Beer: one standard drink = 1/3 bottle of regular strength beer (one bottle is 750 ml).

Indian-made foreign liquor (whisky, vodka, gin, brandy and rum): one standard drink = 30 ml (one bottle is 750 ml).

Urak (local distilled beverage derived from cashew fruit): one standard drink = 60 ml.

Feni (local distilled beverage derived from coconut or cashew fruit, sold in bottles of 750 ml): one standard drink = 30 ml.

Wine: one standard drink = 90 ml.

Toddy (local fermented beverage derived from coconut): one standard drink = 200 ml.