

INVITED REVIEW

ALCOHOL USE IN CHINA

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Abstract — **Aims:** Over recent decades there has been a striking increase in alcohol consumption and related problems in China. As China holds over 22% of the world's population this has a significant potential impact on world health. Here we review English- and Chinese-language publications on the prevalence of alcohol consumption and related problems in China, and treatment and control measures to reduce these. **Methods:** Medline search 1976–2002 and search of the China National Knowledge Infrastructure database 1996–2002. **Results:** While alcohol is a traditional part of Chinese life, commercial alcohol production in China has increased more than 50-fold per capita since 1952. In parallel there is evidence of a marked increase in prevalence of alcohol dependence, which has moved from the ninth to the third most prevalent mental illness. The public health response to increase in alcohol-related disorders has commenced but is in need of further development. **Conclusions:** There is a need for increased policies and public health programmes to reduce alcohol related harm, and evaluation of outpatient treatment potential.

INTRODUCTION

China is a vast country which has 22% of the world's population. Over recent decades there has been evidence of a striking increase in alcohol consumption and related problems in China, with the potential for a major impact on world health. Here we review the prevalence of alcohol use and related problems in China, changes in recent years, and policies and treatments aimed at alcohol-related problems. English-language reports since 1976 were identified by searching Medline and by perusal of bibliographies of identified publications. Further reports were identified by discussions with professionals in the field and internet searching. In total 21 reports were identified, one of which was excluded because of insufficient detail and one because of poor quality. The available English-language reports were largely epidemiological; no English language-reports providing details of interventions to treat alcohol problems were identified.

Chinese-language literature was searched for the period 1996–2002 using the China National Knowledge Infrastructure (CNKI) search. Earlier papers were identified by perusal of bibliographies. In total, 40 relevant papers were identified, of which two were excluded due to insufficient details and six due to poor study methods. As with the English-language reports, most were epidemiological studies.

HISTORY

Evidence of drinking in China dates back 7000 years (Shen and Wang, 1998). Alcohol is part of many traditional festivals and of celebrations such as weddings. During the Spring (New

Year) Festival, a medicinal liquor, made from peppers and cypress leaves, which symbolize luck, health and long life, has been enjoyed since the Han Dynasty (Xiao, 1995; Shen and Wang, 1998). Alcohol is also associated with the arts and poetry: the famous Chinese poet Li Bai is known as the 'saint of alcohol' (Shen and Wang, 1998). Alcohol is commonly used, particularly by men, as part of business meetings, to maintain good relations between supervisors and employees and to promote camaraderie among colleagues (Liu, 1995; Hao *et al.*, 1995b, 1999a).

Chinese cultural norms encourage social drinking and discourage solitary drinking. Despite the custom of toasting (i.e. urging one another to drink and being made to drink as a forfeit at a banquet) and the drinking game known as 'wager', Chinese drinkers tend to remind themselves not to drink too much when with friends. Most social drinking takes place with a meal (Hao *et al.*, 1999a).

TYPES OF BEVERAGE ALCOHOL

A wide range of alcoholic beverages is consumed in China. These include 'strong' distilled liquor (over 50% v/v ethanol), 'less strong' local and foreign liquor (30–40% ethanol), wine and yellow rice wine (12–18% ethanol) and beer (4–6% ethanol). Rice wine is the general designation for all fermented drinks produced from cereals in China, with an ethanol content usually 15–16%. China has two unique forms of alcohol: yellow rice wine ('paddy wine') is rich in amino acids and is colloquially known as 'liquid egg cake'. Additionally medicinal liquor is produced, which incorporates traditional herbs and is used to treat a variety of ailments, including arthritis. Traditional Chinese medicine considers alcohol 'a leader of medicines' that 'can guide other medicines to the place of disease' (Xiao, 1995; Zhang *et al.*, 1996; Shen and Wang, 1998; Hao and Young, 2000).

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Since the end of the 18th and the early 19th centuries, when beer, brandy, whisky and vodka were introduced to China (Du, 1992), the importation of beverage alcohol has been controlled by heavy duties. Taxation on imported liquors was cut in 1995 from 150 to 80% and the volume of sales has doubled in the last decade. There are also many smuggled foreign liquors on the market. Consequently, ever-increasing numbers of Chinese are becoming accustomed to foreign products such as whisky and brandy (Xu, 1995).

The amount of beer produced and consumed in China is increasing steadily, and China is now the second largest beer-producing country in the world (World Drink Trends, 1996). In 1997 the sale of beer accounted for 66.6% of total beverage alcohol sales in China, with spirits at 27.7%. However, spirits still constitute the major absolute alcohol consumption, with more than four times the amount of ethanol consumed as spirits than as beer in 1997 (State Statistical Bureau, 1998).

EXTENT OF ALCOHOL USE

Until the early 1980s, alcohol-related problems were far less prevalent in China than in many western countries (Hao, 1995; Hao *et al.*, 1995a, 1999a; Shen and Wang, 1998). Since then, China has undergone rapid social and economic change with increasing urbanization, westernization and changes to traditional family structure. The change towards a free-market economy has provided a new and vast market for producers and importers of alcoholic beverages.

The rate of commercial production increased sixfold from 0.4 kg beverage alcohol per person in 1952 to just over 2.5 kg by the end of the Cultural Revolution in 1978. Production then increased ninefold up to 22.9 kg per person in 1997 (State Statistical Bureau, 1996, 1997, 1998). Based on current growth rates, annual Chinese beverage alcohol production will rise to 42.5 kg per person by 2005, the same as current annual production in Japan.

Commercial production figures do not provide a precise measure of consumption, and in particular do not capture home alcohol production. A 2001 World Health Organization (WHO) sponsored survey of 24 992 subjects across five centres in China showed an annual ethanol consumption of 4.5 l (SD = 10.9) among adults aged 15 years and older (Hao W. *et al.*, submitted for publication). This was still low compared with industrialized countries: by comparison, annual European alcohol consumption was 8.6 l per person in 2001 (World Health Organization, 2001b). Men drank 13.4 times more than women (men 7.6 l; women 0.6 l; $t = 58.9$; $P < 0.001$). The annual ethanol consumption for those who had consumed any alcohol in the past year was 7.6 l (10.1 l for men, 1.5 l for women). Figures for different age groups are not available. Heavy drinkers (50 ml or 40 g ethanol or more per day) comprised 6.7% of the sample, but contributed 55.3% of all alcohol consumption. The cut-off of 40 g ethanol, chosen to define heavy drinking, is less than that used in some Western countries, as Chinese people in general have lower lean body mass. The mean expenditure on alcohol among drinkers was 16 yuan (SD 39), or 3.7% of the average personal weekly income.

Traditionally, drinking and smoking have been more accepted for Chinese men than for women. Distilled spirit is

the primary beverage of choice for men, accounting for more than one-third of all drinks consumed (Hao *et al.*, 1999a). Women report consuming more wine and beer than other beverages. Anecdotal evidence suggests that people living in Northern China have higher levels of alcohol consumption than those in the south, that urban residents drink lower-strength beverages than do rural residents, and that some minority ethnic groups, such as those of Tibetan and Mongolian background, drink more than other ethnic groups. However, no data documenting these differences were identified.

PATTERN OF DRINKING

A number of epidemiological surveys have been conducted in China (Cheng *et al.*, 1992; Kang *et al.*, 1992; Zhang, 1993; Hao *et al.*, 1999a, 2001). A large, six-centre survey was conducted in China in 1994 (Hao *et al.*, 1999a, 2001) as a result of a four-fold increase in alcohol-related admissions to psychiatric hospitals between 1980 and 1993 (Hao, 1994; Hao *et al.*, 1995b). A total of 23 513 individuals aged 15–65 were surveyed by psychiatrists using the Alcohol Use Questionnaire. This structured instrument was designed by the investigators to assess demographic characteristics, drinking patterns and effect, and attitudes to drinking. Respondents who drank on average more than three times per week or more than 100 ml ethanol per session were screened with the Alcohol-Related Problems Screening Test (APST). This is a 16-item questionnaire, based on the Diagnostic Interview Schedule (Department of Psychiatry, Washington University; Shen *et al.*, 1993) and designed to take account of Chinese sociocultural background (Shen *et al.*, 1993). Respondents who responded positively to two or more items on the APST then underwent an additional structured interview which allowed diagnosis of alcohol use disorders based on DSM-III-R criteria. More than 80% of men (84.1%) and nearly 30% of women (29.3%) were current drinkers but only a minority were daily drinkers. Ninety percent of female and 56.0% of male drinkers consumed alcohol once per week or less, while 16.1% of male and only 2.5% of female drinkers drank at least once per day.

ALCOHOL USE DISORDERS

In the above six-centre study, the prevalence of current alcohol dependence was 6.6% in men and 0.1% in women (3.4% overall) (Hao *et al.*, 1999a, 2001). A further 1.1% of subjects fulfilled the criteria for alcohol misuse. By comparison, Australia, with one of the higher levels of drinking in the English-speaking world, has a similar overall prevalence of dependence (3.5% by ICD10 criteria), made up of a slightly lower prevalence in men (5.2%) but a far higher prevalence in women (1.8%) (Hall *et al.*, 1999). In the Chinese six-centre study, mean age and education level of male subjects were significantly higher than that of female subjects (Hao *et al.*, 1999a, 2001). Urban–rural differences were not presented. The prevalence of alcohol dependence had an inverse-U-shaped association with family income (i.e. individuals with low or high income had a relatively low rate of alcohol dependence). Above a threshold of 8 l ethanol per year, the risk of dependence increased proportionately with consumption (Hao

et al., 1998a,b, 1999b). Using the same survey instrument, the prevalence of alcohol dependence in occupations considered to be associated with excessive drinking was considerably higher: 14.6% in coal miners, 8.9% in lumber workers, 9.1% in long-distance truck drivers and 4.9% in brewery workers (Hao *et al.*, 1999b). Gender differences were not available in relation to these occupations. A separate nationwide survey showed a similar prevalence of dependence to the above six-centre study: 1647 participants out of 44 920 (3.7%) were diagnosed as alcohol dependent based on ICD-10 (Collaborative Research Group on Alcoholism and Related Problems, 1992a,b).

Both epidemiological surveys and hospital discharge data reflect a marked increase in alcohol dependence over the past 10–20 years (Collaborative Group, 1986, 1993; Shen, 1987; Le and Xu, 1992; Zhang, 1992). In the earliest reported field survey of mental morbidity in China, Shen *et al.* surveyed 38 136 persons aged 15 and over from 12 000 households in 12 regions in the early 1980s (Collaborative Group, 1986). Only six cases (0.016%) could be diagnosed as alcohol dependent according to ICD-9 criteria. A second nationwide survey was conducted 10 years later in 1993, covering seven regions (Collaborative Group, 1986, 1993). The prevalence of ICD-9 alcohol dependence had risen more than 40-fold to 0.68%, and alcohol dependence ranked as the third most prevalent cause of mental illness. This figure may still be an underestimate, as it is significantly lower than the prevalence of dependence of 3.4% from the six centre survey (cited above) conducted the following year (Hao *et al.*, 1999a, 2001). In parallel with increases in alcohol dependence in surveys, a report from Chongqin First Psychiatric Hospital similarly reflected a ten fold increase in alcohol dependence over a 10 year period: alcoholism accounted for 0.53% of total admissions in 1980, ranking as the 9th most prevalent diagnosis, and by 1990 accounted for 5.3% ranking as 3rd most common. (Le and Xu, 1992)

It is difficult to ascertain to what extent differences in diagnosis rate, survey methodology, and reporting have impacted on this apparent dramatic increase in the prevalence of alcohol dependence. Nonetheless, the rise in prevalence of alcohol dependence has paralleled similarly dramatic increases in commercial alcohol production (see above), and considerable change within Chinese society (World Health Organization, 2001a).

DRINKING IN YOUNG PEOPLE

A convenience sample of university students at Guangxi University in South East China found similar prevalence of any alcohol consumption to the above surveys, using a Chinese adaptation of the Student Alcohol Questionnaire (Lu *et al.*, 1997). A survey of adolescents in Beijing public schools showed 78% of boys and 61% of girls had consumed alcohol in the last year, with increasing prevalence of drinking with advancing age (Li *et al.*, 1996). Drinking behaviour was associated with participation in unstructured social activities and with problem behaviors. A similar prevalence of alcohol consumption was found in high school students in Weifang City (Guang-Ren, 1997), suggesting many students, especially boys, have early contact with alcohol. In contrast, a slightly lower rate (53%) of subjects aged 15–19 in the six-centre study by Hao *et al.* (2001) had consumed alcohol in the past year.

ATTITUDES TO DRINKING

Hao *et al.* (1995a), reported a similar prevalence of drinking to the above studies in a three centre survey. These authors also examined reasons for choosing whether to drink. The three main reasons given for choosing not to drink were that it was bad for health, costly and carries societal disapproval. Women were much more likely to report being sensitive to disapproval from family and peers, whereas men were more concerned with health and finances. Reasons for drinking were much as expected in any society: alcohol's positive social effects, relief of tension and worry, and relief of craving and withdrawal symptoms. The authors noted the 'double standards' applied to drinking between men and women. Although this is not unique to China, it appears to have a greater bearing on behavior than in many western countries. The authors express concern that women's rate of alcohol consumption may rise as further westernization takes place. An earlier community survey conducted among highly educated groups in Shanghai (Shen and Wang, 1998) had shown only 13% of people were opposed to alcohol on health and social grounds, and interestingly these people also thought that there should more social and legislative measures to control alcohol.

ALDEHYDE DEHYDROGENASE ABNORMALITIES

Over 10% of Chinese are estimated to respond to a small amount of alcohol with a 'flushing' reaction, due to a variant of the enzyme aldehyde dehydrogenase which is involved in the metabolism of alcohol. These symptoms are generally unpleasant and 'flushers' report much lower alcohol consumption (Hao *et al.*, 1999a). Those who are homozygous or heterozygous for the enzyme deficiency, who go on to drink, may be more likely to encounter physical complications of alcohol (Wu *et al.*, 2001).

CONSEQUENCES OF DRINKING

Moderate alcohol consumption is widely perceived to be beneficial in Chinese culture. Recent research, in China and elsewhere, suggests that this is indeed likely. A Chinese study of alcohol and mortality in middle-aged men found that consumption of no more than two drinks per day was associated with a 19% reduction in mortality (relative risk 0.81; 95% CI 0.70–0.94 after age, level of education and cigarette smoking were adjusted) (Yuan *et al.*, 1997).

Most of the available evidence on health related harms from alcohol in China comes from increasing admission rates to psychiatric hospitals (Le and Xu, 1992; Hao *et al.*, 1995b), and it is difficult to discern the extent to which this is due to increased prevalence of problems, increased presentation for treatment or improved reporting. In a nationwide survey, out of 1647 participants with ICD-10 alcohol dependence, 284 (17.2%) had digestive system diseases including chronic gastritis, peptic ulcer, hepatitis, cirrhosis and fatty liver (Collaborative Research Group on Alcoholism and Related Problems, 1992a,b). In a separate study of 88 patients with chronic alcohol dependence, the liver enzymes aspartate aminotransferase, alanine

aminotransferase and gamma glutamyltransferase were mildly or severely abnormal in 41.5% of cases (Hu, 1998). The degree of abnormality was associated with frequency of drinking in the last month, and with poor nutrition as indicated by markers such as zinc and vitamin B1. Liver biopsy of 89 patients with a five year or more heavy drinking history in Beijing showed mild alcoholic liver disease (41.6%), fatty liver (6.7%), alcoholic hepatitis (10.1%) and chronic alcoholic hepatitis (11.2%), alcoholic fibrosis (16.8%) and alcoholic cirrhosis (7.9%) (Chang and Wang, 1993).

Accurate national figures on the prevalence of alcohol-induced cirrhosis are not readily available. A report on the Zang (Tibetan) ethnic minority showed that of 41 pathologically confirmed cases of cirrhosis in 1987, 25 (61.0%) were identified as alcoholic cirrhosis (20 men, 5 women) (Zhao and Li, 1989). The prevalence of alcoholic liver disease in the general population is likely to increase with the nation's rise in alcohol consumption (Qin, 1993). The role of alcohol in exacerbating viral liver damage in China has not yet been studied. An association between heavy alcohol consumption and higher rates of liver (and esophageal cancer) has been reported (Shen and Wang, 1998).

Hu (1998) assessed 88 alcoholic men using the Halstead-Reitan Battery neuropsychological test. They found major cognitive impairment particularly affecting the frontal lobes (mean index of Brain Damage Quotient 0.52; SD = 0.25). Extent of impairment correlated significantly with the number of drinking years, and the number of years of drinking with reduced food intake. Computer tomography scans revealed moderate or severe degeneration in the left and right cortex in 96 and 97% of cases, and moderate and severe cerebral atrophy in 52.3 and 28.4% of cases, respectively. In addition, 19.3% and 29.6% had moderate or severe cerebellar atrophy.

There has been no formal assessment of the role of alcohol in traffic accidents, suicides, burns or drowning in China. A large prospective study showed that *Trichomonas vaginalis* (a sexually transmitted infection) occurred at an increased rate (relative risk 1.5) in women who drank alcohol, suggesting alcohol might play a part in this, and probably other, sexually transmitted diseases (Zhang, 1996). While there is some evidence of social disruption caused by alcohol dependence (Shen and Wang, 1998), the studies conducted have been informal or limited to small groups. Alcohol has been reported to be more likely to be associated with violent crime rather than property crime in men (Zhang *et al.*, 2000).

TREATMENT OF ALCOHOL USE DISORDERS

There are few published reports of current treatment methods for alcohol dependence in China. Treatment lies mainly within the realm of psychiatry and is largely in-patient based, often medicated and for prolonged periods, and so expensive. Facilities have been established for treatment of substance misuse, but in 1988 there were no specific alcohol treatment centres (Shen and Wang, 1998). Home detoxification has been relatively unexplored and self-help organizations similar to alcoholics anonymous exist only in certain regions. No reports were identified of use of the recently available pharmacotherapies for alcohol dependence — acamprosate and naltrexone — in treatment of alcohol dependence, though naltrexone has been

used to treat acute alcohol intoxication in the emergency department (Zhong and Xie, 2002). There are past reports of use of a range of psychotherapeutic techniques, including aversion therapy, deep breathing exercises (ogong), acupuncture and moxibustion (heat application) (Zhang, 1992), but few details or evaluations were reported.

Kudzu (*Pueraria lobata*) is one of the earliest known medicinal plants. Although both the roots and flowers of kudzu ('Radix' and 'Flos puerariae' respectively) have been used to treat drinking problems in China for more than a millennium, their efficacy, active constituents, sites and mechanisms of action have only recently been critically examined. Keung and Vallee (1998) demonstrated that a crude extract of 'Radix puerariae' suppresses the free-choice ethanol intake of ethanol-preferring golden Syrian hamsters. These authors identified two of its isoflavones, daidzin and daidzein, as possible causes of this effect.

PREVENTION AND CONTROL

Hao (1995) commented on the lack of comprehensive public health policy on alcohol. Access to alcohol has few restrictions and controls. There is no limit to the age at which it can be bought or consumed, and alcohol is freely available in supermarkets and other shops. Alcohol advertising is widespread, including on television, and appears to have been very successful for specific brands (Shen and Wang, 1998).

Although beverage alcohol is one of the highest taxed commodities in China, taxation is seen by some as revenue raising rather than a means to control consumption. There is a considerable market for illicitly produced alcohol marketed as famous brands, which in the past has resulted in poisoning of large numbers of people (Shen and Wang, 1998). The China Consumers' Association launched a nationwide campaign to combat counterfeit products, but this has been accused of being motivated more by profit-loss to the legitimate industry than by concern for health (Xu, 1995; Shen and Wang, 1998).

Hao (1995) also noted that the health services' response to alcohol has traditionally focused on treatment of complications with little focus on the underlying alcohol use disorder. No publications were found on harm reduction or prevention programmes although these may be beginning to emerge. There are no national recommendations on safe drinking limits. Such recommendations will be difficult to develop and disseminate because of the lack of standardized beverage sizes. Where home-produced alcohol is consumed, it is even more difficult to determine strength and beverage sizes. There is no specific legislation to address drink driving.

EARLY INTERVENTION PROGRAMS

Since the mid-1990s there have been efforts to promote early intervention techniques in China (Conigrave, for WHO, 1996), but currently these do not appear to be routinely implemented. The ability of any health service to provide early intervention also depends on staffing and resources. In some centres, particularly in rural regions, any additional clinical activity is not feasible, in others, doctors may not consider early intervention to lie within their responsibilities.

Much health care insurance is linked to place of employment (Tomlinson, 1997). The suitability of work centres for alcohol screening and intervention is likely to vary widely and, as with any western workplace, the effectiveness of such a programme, will be influenced by how secure employees feel that information they provide will not affect their employment prospects.

CONCLUSIONS

While alcohol is an integral part of Chinese culture, experts in the field have been alarmed at the rate of increase of consumption and related problems, and a lack of comprehensive public health policy to deal with this. Hao (1995) noted that the usual research difficulties have been compounded by the logistics of such a large country and the lack of qualified researchers, stemming from cultural factors discouraging research prior to the 1980s.

There is a need for further higher-quality trials on the benefits of existing treatment programmes, and a review of the optimum duration of inpatient treatment. Increased use of outpatient detoxification has the potential to dramatically reduce the cost of treatment, freeing up funds for prevention or early intervention.

It is likely that alcohol use and related disorders will increase as a public health problem in China over the coming years, and so the global burden of ill health related to alcohol use will grow. A collaborative approach is needed with researchers and policy makers to ensure workable legislative changes and public education about the hazards of excessive drinking. Specific programmes may be needed to target the young, who are emerging as high consumers. In the past, agencies such as the World Health Organization (WHO) have provided support for China's efforts to address alcohol use disorders. Given the scale of the country and the relative newness of alcohol as a major public health problem, ongoing support and collaboration are likely to be needed.

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***Editor's Note:** Readers will note that these three papers were listed in MEDLINE under the first name (Wei) of the first author (Dr Hao, who is co-author of this Invited Review) in accordance with Chinese custom. Readers wishing to consult these papers should therefore search under Wei *et al.* (A.A.–B.B.).