DETECTION AND ASSESSMENT

The Chinese Translations of Alcohol Use Disorders Identification Test (AUDIT) in China: A Systematic Review

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Abstract — **Aims:** To systematically review the literature on the Chinese translations of the Alcohol Use Disorders Identification Test (AUDIT) and their cross-cultural applicability in Chinese language populations. **Methods:** We identified peer-reviewed articles published in English ($n = 10$) and in Chinese ($n = 11$) from 1980 to September 2009, with key words China, Chinese and AUDIT among PubMed, EBSCO, PsycInfo, FirstSearch electronic databases and two Chinese databases. **Results:** Five teams from Beijing, Tibet, Taiwan and Hong Kong reported their region-specific translation procedures, cultural adaptations, validity (0.93–0.95 in two versions) and reliability (0.63–0.99). These Chinese translations and short versions demonstrated relatively high sensitivity (0.880–0.997) and moderate specificity (0.709–0.934) for hazardous/harmful drinking and alcohol dependence, but low specificity for alcohol dependence among Min-Nan Taiwanese (0.58). The AUDIT and its adaptations were most utilized in workplace- and hospital-settings for screening and brief intervention. However, they were under-utilized in population-based surveys, primary care settings, and among women, adolescents, rural-to-urban migrants, the elderly and minorities. Among 12 studies from mainland China, four included both women and men, and only one in Tibet was published in English. **Conclusion:** There is a growing amount of psychometric, epidemiologic and treatment research using Chinese translations of the AUDIT, much of it still unavailable in the English-language literature. Given the increase in burden of disease and injury attributable to alcohol use in the Western Pacific region, the use of an internationally comparable instrument (such as the AUDIT) in research with Chinese populations presents a unique opportunity to expand clinical and epidemiologic knowledge about alcohol problem epidemics.

INTRODUCTION

Alcohol use and screening in China

Located in East Asia with an ancient civilization and nearly 4000 years of continuous history, China has evidence of drinking dating back ~7000 years and contemporary cultural norms that encourage social drinking (Hao *et al.*, 2005). Rapid increases in alcohol consumption and related problems have been observed in China, accompanying significant societal and economic changes, including urbanization, industrialization and globalization (Hao *et al.*, 1995, 2007; Zhang *et al.*, 2004). Based on a cluster sample of 24,992 respondents aged 15 or above in cities and rural areas in five provinces in 2001, past-year drinking rates of 74.9, 38.8 and 59.0% were reported for men, women and the total sample, respectively. In random samples of urban populations in Wuhan city, all age groups showed increases in alcohol consumption from 2002 to 2005, especially adolescents aged 18–19 years (females from 34 to 63%; males from 70 to 85%) (Hao *et al.*, 2004). Overall, the global burden of disease related to alcohol use is significant in China, ranking as the second leading risk factor at 5.6%, between high blood pressure (7.3%) and tobacco (4.9%) in 2001 (Disease Control Priorities Project, 2006; Mathers *et al.*, 2006). The avoidable burden of disease and injury attributable to alcohol use in China is also very high, in terms of their alcohol-attributable disability-adjusted life-years (Rehm *et al.*, 2009).

Because alcohol use patterns are heterogeneous ranging from alcohol dependence to hazardous and harmful drinking (Edwards *et al.*, 1981; Reid *et al.*, 1999), each part of the spectrum requires a different approach to screening, diagnosis and management (Babor and Kadden, 2005). Harmful drinking is defined as a level of alcohol consumption that has already resulted in physical or psychological harm but does not meet criteria for alcohol dependence, whereas hazardous drinking is defined as alcohol consumption that places individuals at risk for related consequences (Edwards *et al.*, 1981). Hazardous and harmful drinking have been important for early intervention and the secondary prevention of drinking problems because they are more common than alcohol dependence, and may be more responsive to treatment (Saunders and Conigrave, 1990). The availability of an effective, inexpensive, simple and quick screening tool could facilitate the monitoring and evaluation of alcohol use disorders, and help to promote early intervention in clinical settings and communities. An effective screening tool should be reliable, valid, culturally sensitive and acceptable to both providers and the target populations.

The extent of alcohol use disorders in China may be underestimated partially due to the absence of structured detection tools (Yang, 2002), especially for less severe disorders. Although a variety of self-report alcohol screening measures are available in English (Allen *et al.*, 1997; Babor and Kadden, 2005), only a few psychiatric instruments have been used to assess alcohol-related problems in China (Chen *et al.*, 2005b; Collaborative Research Group on Alcoholism and Related Problems, 1992a, b; Hao *et al.*, 1999, 2004; Kim *et al.*, 2008; Lee *et al.*, 2009; Tang *et al.*, 2005b; Zhou *et al.*, 2009). These population-based studies have been useful in providing estimates of alcohol dependence and alcohol-related problems, and they reinforce the need for a screening test that can be used for early detection of alcohol use disorders and hazardous drinking in the community.

The alcohol use disorders identification test

The Alcohol Use Disorders Identification Test (AUDIT) was designed by World Health Organization (WHO) in the 1980s

(Babor and Grant, 1989; Babor *et al.*, 1992; Saunders *et al.*, 1993) to identify alcohol use disorders in diverse settings and multicultural populations (Allen *et al.*, 2001; Reinert and Allen, 2002, 2007). It is the only instrument designed specifically to identify hazardous and harmful drinking (Reid *et al.*, 1999). This 10-item scale assesses three conceptual domains: the quantity and frequency of alcohol intake (Items 1–3), dependence symptoms (Items 4–6) and alcohol-related problems (Items 7–10). It can be used as a self-report measure, or administered orally. A comprehensive methodology was used to assess its accuracy, feasibility and utility; and since its development it has been subject to extensive psychometric evaluation (Allen *et al.*, 1997; Reinert and Allen, 2002, 2007).

The initial comparative field study to develop the AUDIT was conducted in six countries (Norway, Australia, Kenya, Bulgaria, Mexico and the USA), but there was no representation from the WHO Western Pacific region. The AUDIT has been translated from English into many languages, including Greek (Moussas *et al.*, 2009), Spanish (Santis *et al.*, 2009), Japanese (Kawada *et al.*, 2010), Konkani, Marathi and Hindi (Nayak *et al.*, 2009). Despite the increase in burden of disease and injury attributable to alcohol use in the Western Pacific region (Rehm *et al.*, 2009) and the increasing need to establish psychometric properties of the Chinese versions of the AUDIT, a systematic review of validation data for its Chinese translations has been lacking. For example, recent reviews (Berner *et al.*, 2007; Reinert and Allen, 2007) reported only one study (Tsai *et al.*, 2005) of a Chinese version, which was conducted in Taiwan and published in English.

To provide a better assessment of the current uses and potential applications of the AUDIT in China, we conducted a systematic review of the Chinese translations of the AUDIT. We had a specific interest in validation research and cultural adaptations of the AUDIT in China. Because the prevalence of alcohol use disorders in China varies across regions with different drinking customs and spoken languages, it is not surprising that there would be different versions of the AUDIT in Chinese. Different brands of alcohol products are often sold in large bottles in mainland China and small cans in Taiwan and Hong Kong. Mandarin is dominant in mainland China and Taiwan, whereas Cantonese and English have been popular in Hong Kong. Notably, 55 ethnic minorities with their own dialects and cultural customs have their own drinking histories and behaviors, which could be under-researched in the literature. Therefore, we conducted a systematic review of the literature on the utilization of the Chinese translations of the AUDIT, focusing on sample settings, cultural adaptations, psychometric properties, classification and validation issues related to the utilizations of the AUDIT in Chinese populations. We also sought to identify gaps in the existing literature, and to suggest directions for the cross-cultural applicability of its Chinese translations.

MATERIALS AND METHODS

Inclusion criteria

A comprehensive literature search was conducted to identify articles that were published in English or Chinese-language journals from 1980 to September 2009, and that reported the utilization of the Chinese translations of the AUDIT in China. Since different drinking contexts and healthcare systems in diverse regions of China could affect its utilization, articles in Tibet, Hong Kong and Taiwan were included in this review to investigate its regional variance.

Data source and presentation

Key words such as China, Chinese and AUDIT were searched in September 2009. The English publications were searched through PubMed, EBSCO, PsycInfo and FirstSearch electronic databases. The Chinese publications were searched using the same key words translated in Chinese, among the Chinese National Knowledge Infrastructure database and the Chongqing VIP information Chinese Scientific and Technical Journal database which covers 1810 core Chinese journals (Chongqing VIP, 1993). The reference lists of the identified articles were then hand-searched.

RESULTS

Publication language, data presentation and cited sources of the AUDIT

We identified 10 peer-reviewed articles published in English (Chen *et al.*, 2004, 2005a; Guo *et al.*, 2008; Huang *et al.*, 2009; Leung and Arthur, 2000; Tang *et al.*, 2005a; Tsai *et al.*, 2005, 2009; Wu *et al.*, 2008; Yen *et al.*, 2008) and 11 articles published in Chinese (He *et al.*, 1997; Li *et al.*, 2003a, b, c, 2006; Ma *et al.*, 1998; Meng and Ge, 2005; Sheng *et al.*, 2009; Sun *et al.*, 1998; Zhi *et al.*, 2007; Zhou *et al.*, 2005). This literature, which deals with the translation, validation and utilization of the Chinese translations of the AUDIT, shows quite divergent publication practices by regions. Except for the study in Tibet published in English (Guo *et al.*, 2008), 11 studies (He *et al.*, 1997; Li *et al.*, 2003a, b, c, 2006; Ma *et al.*, 1998; Meng and Ge, 2005; Sheng *et al.*, 2009; Sun *et al.*, 1998; Zhi *et al.*, 2007; Zhou *et al.*, 2005) conducted in mainland China were all published in Chinese. In contrast, nine studies (Chen *et al.*, 2004, 2005a; Huang *et al.*, 2009; Leung and Arthur, 2000; Tang *et al.*, 2005a; Tsai *et al.*, 2005, 2009; Wu *et al.*, 2008; Yen *et al.*, 2008) from Taiwan and Hong Kong were all published in English.

Table 1 summarizes translation procedures, cultural adaptations and psychometric properties of the AUDIT for nine studies that were primarily methodological in nature. Table 2 describes the 12 clinical and epidemiologic studies using Chinese translations of the AUDIT, based on sources cited in Table 1 or in earlier books. The AUDIT was first translated into Chinese in 1989 in mainland China (Xue, 1989). Later, several teams in the mainland (Li *et al.*, 2006; Ma *et al.*, 1998; Meng and Ge, 2005; Sheng *et al.*, 2009; Sun *et al.*, 1998; Zhou *et al.*, 2005) cited books on psychiatric medicine (Guo and Zhang, 1993), psychological assessment (Wang *et al.*, 1999) or the version from Xue (1989) as the source of the Chinese translation of the AUDIT but without clear citations or details on its validation process (Tables 1 and 2).

Cultural adaptations and validation

The adaptation and validation process used in these studies varied by regions, and appears to conform to local cultures

Table 1. Summary of studies on translation and validation of the Chinese versions of the AUDIT in China, 1980–2009

Author	Sample (gender, age, venue)	Cultural adaptations (yes/no) Psychometric procedures Sources cited, if any	Diagnostic measure	Cut-off point	Positive (%)	Se	Sp
He *et al.* (1997)[a]	109 male workers, 18–55, a factory in Zhaozhuang city, mainland	No Validation National collaborative group	ICD-10 alcohol dependence and harmful use	6 8		79 66	79 85
Ma *et al.* (1998)[a]	768 male workers, 18–60, iron-steel complex, mainland	No Known-group validation Guo and Zhang (1993)	Alcohol dependence	13	14		
Leung and Arthur (2000)	450 (224 F, 226 M), 10–87, 3 sites (hospital, community, university), Hong Kong	Yes-18 items in Cantonese Validation	Hazardous/harmful drinking in each site	8 8 8	14.5 6.2 5.3		
Li *et al.* (2003)[a]	420 male workers, 18–60, one auto factory, Changchun, Jilin, mainland	Yes, translation in Mandarin Validation	Hazardous/harmful drinking ICD-10 alcohol dependence	7 16		99.7 92.7	90.0 70.9
Chen *et al.* (2004)	422 nonpsychiatric inpatients in one general hospital in Taiwan	Yes, translation in Mandarin Validation	Alcohol use disorders SCAN alcohol abuse SCAN alcohol dependence	5/6	16.5 3.9 12.6	100	84
Chen *et al.* (2005a)	Ibid	No Reliability Chen *et al.* (2004)	DSM-IV alcohol use disorders	8		97	90
Tsai *et al.* (2005)	112 (78 M, 34 F) in one hospital, 20–86, 74% ethnic Min-Nan Taiwanese, Taiwán	Yes Validation, AUDIT and its short version AUDIT-C	Harmful drinking ICD-10 alcohol dependence	8 3 11 5	31.3 15.2	96 98 94 94	85 73 63 58
Wu *et al.*, 2008	404 patients (242 M, 162 F) in Taiwan	No Validation, AUDIT, AUDIT-C, AUDIT-4, and AUDIT-3 Chen *et al.* (2004)	SCAN hazardous drinking	7 4 6 1	25	90.0 90.0 90.0 88.0	93.4 92.1 90.8 86.8
Guo *et al.* (2008)	3171 residents in Lhasa, Tibet, (1054 M, 2117 F), mainland	Yes, test AUDIT in Tibetan Validation	Alcohol use disorders DSM-IV alcohol abuse DSM-IV alcohol dependence	8 10 13	16.21 2.7 3.5	87.7 85.7	88.1 84.6

ICD-10, the International classification of diseases, tenth revisions; SCAN, schedules for clinical assessment in neuropsychiatry; DSM, diagnostic and statistical manual of mental disorders.
[a]Studies in Chinese; Ibid: the same as above; M, male; F, female; Se, sensitivity; Se, specificity; AUD, alcohol use disorders; AUDIT-C, the first three questions in the AUDIT questionnaire; AUDIT-4, the first three and last questions; AUDIT-3, the third question in the AUDIT questionnaire.

(Table 1). Two early articles on validation were from mainland China. Using the drinking and health questionnaire, which included the AUDIT from the national collaborative group, He *et al.* (1997) reported moderate sensitivity (0.66–0.79) and specificity (0.79–0.85) for alcohol dependence and harmful use using cut-off points 6 and 8 against the criteria from the International Classification of Diseases, Tenth Revision (ICD-10), and alcohol-attributable diseases and social problems. Investigating its construct validity using the known-group validation procedure, Ma *et al.* (1998) found that male workers with a higher level of education had a lower prevalence of alcohol dependence. Furthermore, five research teams (Chen *et al.*, 2004, 2005a; Guo *et al.*, 2008; Leung and Arthur, 2000; Li *et al.*, 2003a; Tsai *et al.*, 2005) from Hong Kong, Beijing, Taiwan and Tibet reported their region-specific processes of translation procedures, cultural adaptations and tests of validity and reliability, with appropriate inclusion of ethnic minorities.

In Hong Kong, an 18-item modified Chinese translation of the AUDIT was developed by Leung and Arthur (2000) and utilized by Tang *et al.* (2005a). It was administrated in Cantonese, including six new items after the first question to consider the drinking practices in Chinese culture and to assess the frequency of an individual's specific consumption of beer, western wine, brandy, Chinese wine, Chinese tonic wine and Chinese liquor. Two more questions were added,

'Do you think you presently have a problem with drinking?' and 'In the next 3 months, how difficult would you find it to cut down or stop drinking?' No obvious difference was found between the back-translated copy and the original English version, confirming the equivalence of the two versions. In the preliminary study of 15 participants in a youth community center, the reliability coefficient of item responses of the participants was 0.99 over a 2-week interval. The content validity index was 0.93, when it was reviewed by an expert panel including five international and local experts. In the main study of 450 participants recruited from hospitals, a University health clinic and community centers, an exploratory factor analysis was conducted and reported that the 18 items loaded on a single factor with factor loadings between 0.69 and 0.94 and internal consistency reliability between 0.96 and 0.97. No study in Hong Kong has reported its sensitivity and specificity.

In Beijing, one team at the Institute of Mental Health, Peking University reported the cultural adaptation process from English into Chinese (Li *et al.*, 2003a). The lead author translated the English version of AUDIT into Chinese, which was verified by two experts. Some items were modified to fit the Chinese cultural context. Specifically, volumes in the definition of the standard unit of alcohol use in the second and third questions were transferred into those of 56 degree liquor or beer. The inter-rater reliabilities of pilot and

Table 2. Summary of studies on the utilization of Chinese versions of the AUDIT in China, 1980–2009

Author	Sample (gender, age, venue)	Sources cited, if any	Measure	Cut-off point	Positive (%)	Main findings
Sun et al. (1998)[a]	768 male workers, 18–60, iron-steel complex, mainland	Guo and Zhang (1993)	Alcohol dependence Problem drinkers	13 7–12	13.8 24.6	People with alcohol dependence experienced more mental health problems
Li et al. (2003b)[a]	420 male workers, 18–60, one auto factory, Changchun, Jilin, mainland	Li et al. (2003a)	Hazardous/harmful drinking Alcohol dependence	7 16	66.9 16.4	Alcohol intake, psychosocial and physical damages varied by groups
Li et al. (2003c)[a]	141 male workers, one auto factory, Changchun, Jilin, mainland, intervention, follow-up	Li et al. (2003a)	Scores of AUDIT and its three domains			Significant decreases in scores of AUDIT and its three domains at 3 months after early intervention
Tang et al. (2005a)	300 patients (297 M,3 F) 77% retired, Hong Kong	Leung and Arthur (2000)	Hazardous/harmful drinking	8	36.1	Most patients did not drink
Meng and Ge (2005)[a]	270 male middle school students in Yangzhou, Jiangsu, mainland	Xue, 1989	Social drinking No social drinking	(4, 8) <4	22.6 77.4	Social drinkers were common, and experienced more life events
Zhou et al. (2005)[a]	631, drinkers 149 M, 86 F, Mang minority, Jinping, Yunan, mainland	Wang et al. (1999)	Harmful drinking	≥7	45.9	Prevalent harmful drinking in local Mang minority community
Li et al. (2006)[a]	1019 patients (481 M, 538 F), mean age 50.5, in one hospital in Beijing, mainland, screening and early intervention	Wang et al. (1999)	Hazardous drinking Harmful drinking	[7, 15) [6,13) ≥15 ≥13	12[b] 5.5[b]	1-year follow-up of 172 randomized patients (56 lost follow-up) showed significant decrease in scores of AUDIT and its three domains for intervention group
Zhi et al. (2007)[a]	970 students (485 M, 485 F), 17–23, Guangzhou, Zhenzhou, mainland	Xue version in Wang et al. (1999)	Three domains of the AUDIT			Higher scores of three domains of the AUDIT among students in Zhenzhou, external controlled, males, higher grades
Yen et al. (2008)	203 M, 98 F, 18–60, 3 tribes in southern Taiwan	Chen et al. (2004), native language	Alcohol use disorders	8	82.8	Problem drinkers were common, and had poor insight into alcohol-related problems
Huang et al. (2009)	400 patients (196 M, 204 F) in Taiwan	Chen et al. (2004)	Alcohol use disorders Alcohol dependence		9.8 8.3	Alcohol use disorders were common in patients, and easily neglected by medical staff
Tsai et al. (2009)	190 patients, 199 controls, Taiwan, randomized trial (225 M, 50 F)	Tsai et al. (2005)	Scores of AUDIT and its three domains			1-year follow-up showed significant decreases in scores of AUDIT and its three domains for intervention group
Sheng et al. (2009)[a]	54 male fishermen, 69 harbor laborers, 20–50, case-control, cluster sampling, Jiangshu, mainland	Wang et al. (1999)	Harmful drinking Alcohol dependence		37.0 18.5	Alcohol use disorders were more prevalent among fishermen than harbor laborers

Three domains of the AUDIT referred to alcohol intake (Items 1–3), alcohol dependence (Items 4–6), and alcohol-related problems (Items 7–10).
[a]Studies in Chinese; M, male; F, female.
[b]Rate at gender-specific cut-off points.

main studies were 0.83 and 0.63 (Li et al., 2003a). With cut-off points 7 and 16, it demonstrated high sensitivity (0.927–0.997) and moderate specificity (0.709–0.900) for hazardous/harmful drinking and alcohol dependence (Li et al., 2003a, b), using criteria from ICD-10.

In Taiwan, three teams validated their Chinese translations of the AUDIT. First, Chen et al. (2004) translated and back-translated the AUDIT into Chinese, and reported the sensitivity of 100% and specificity of 84% at the cutoffs of five and six for alcohol use disorders in two-phase screening with the AUDIT, using the Schedules for Clinical Assessment in Neuropsychiatry (SCAN) as a gold standard. For the same sample, this research team (Chen et al., 2005a) reported later that 1-week test–retest reliability was 0.95. The sensitivity and specificity of the AUDIT at the optimal cutoff of 8 were 0.97 and 0.90, respectively. The area under the Receiver Operating Characteristic curve of the AUDIT for current alcohol use disorders was 0.98. A stratum-specific

likelihood ratio analysis was also conducted. Later, Tsai et al. (2005) reported the process to resolve the mild difference between the translation by a master's-prepared nurse with expertise in substance abuse care and back translation by a bilingual scholar. In this study, a content validity index was 0.95, when it was reviewed by a panel of five experts in alcohol and substance abuse care. Its internal consistency was 0.86. With cut-off points set at 8 and 11 and ICD-10 as the criterion, this Chinese translation demonstrated high sensitivity (0.94–0.96) and moderate specificity (0.63–0.85) for alcohol dependence and harmful use. Tsai et al. applied this validated version in a later study (Tsai et al., 2009).

Two additional studies in Taiwan (Tsai et al., 2005; Wu et al., 2008) reported the abbreviated Chinese translations of the AUDIT. A scale with the first three alcohol consumption items was defined as the AUDIT-C. Using ICD-10 or SCAN as the gold standard, these studies utilized 3–5 as cut-off points and reported high sensitivity (0.90–0.98) for hazardous

and harmful drinking and alcohol dependence (Tsai *et al*., 2005; Wu *et al*., 2008). However, the specificity of the AUDIT-C using a cut point of five in the sample with 74% Min-Nan Taiwanese was low (0.58) for alcohol dependence; and the specificity using cut-off points three and four for harmful use was moderate (0.73–0.921) (Tsai *et al*., 2005). According to Wu *et al*. (2008) the AUDIT-3 (i.e. with the third alcohol consumption item) and the AUDIT-4 (i.e. with the first three alcohol consumption items and the last item) had high sensitivity and specificity 0.868–0.908; and the Chinese translation of the AUDIT and its short forms performed better than other instruments including the 13-item Michigan Alcoholism Screening Test, the TWEAK test (tolerance, worried, eye opener, amnesia and cutdown) and the CAGE test (cutdown, annoyed, guilty and eye opener).

In Lhasa, Tibet, 3171 residents were recruited through stratified cluster random sampling and interviewed in Tibetan using the Chinese Han Interview Version of the AUDIT (Guo *et al*., 2008). The translation process was not documented. The research team members were native Tibetans and fluent in both Chinese Mandarin and Tibetan, and included experienced psychiatrists from West China Hospital of Sichuan University. They estimated that one measure (300–330 ml) of self-brewed highland barley wine was one standard drink of 10 g of alcohol. For the AUDIT, the reliability among investigators was higher than 0.90; the test–retest reliability was 0.99; in confirmatory factor analysis, two factors, each including five items, explained 59.4% of the variance. The correlation coefficient with the diagnostic and statistical manual of mental disorders fourth edition (DSM-IV) criteria was 0.84, and the sensitivity and specificity of alcohol abuse and dependence were greater than 0.84 when the cut-off points were 10 and 13.

Venue and sample, screening and monitoring

The Chinese translations of the AUDIT were tested or utilized in multiple populations across mainland China, Hong Kong and Taiwan (Tables 1 and 2). Each region sampled hospitals (Chen *et al*., 2004; Huang *et al*., 2009; Li *et al*., 2006; Tang *et al*., 2005a; Tsai *et al*., 2005; Wu *et al*., 2008). In addition, one study in Hong Kong sampled residents in communities and universities (Leung and Arthur, 2000). Studies in mainland China also sampled other venue-based populations, including students in urban universities (Zhi *et al*., 2007) and a middle school in a rural village (Meng and Ge, 2005), and workers in workplaces including an iron and steel complex (Ma *et al*., 1998; Sun *et al*., 1998), a machine tool factory (He *et al*., 1997), one auto factory (Li *et al*., 2003a, b, c) and a maritime setting (i.e. fishermen and harbor laborers) (Sheng *et al*., 2009). However, none of the studies sampled outpatient settings. For minorities, one population-based study utilized stratified cluster random sampling to recruit 3171 Tibetans in Lhasa, Tibet (Guo *et al*., 2008); one study conducted a household-based census of the Mang minority in four isolated villages in Jinping County, Yunan (Zhou *et al*., 2005); and two sampled indigenous populations in tribes in southern Taiwan (Yen *et al*., 2008) and Min-Nan Taiwanese in northern Taiwan (Tsai *et al*., 2005). Studies in Hong Kong and Taiwan sampled both men and women. Four studies (Guo *et al*., 2008; Li *et al*., 2006; Zhi *et al*., 2007; Zhou *et al*., 2005) in mainland China included both genders; and eight investigated men only.

Among studies that reported drinking prevalence (Tables 1 and 2), 5.3–66.9% of participants (Guo *et al*., 2008; Leung and Arthur, 2000; Li *et al*., 2003b) were identified with hazardous and harmful drinking, and 13.5–18.5% of participants (Guo *et al*., 2008; Ma *et al*., 1998; Sheng *et al*., 2009; Sun *et al*., 1998) were classified as having alcohol dependence. Three studies reported significant decreases in scores of the AUDIT and its three domains at 3-month or 12-month follow-up as the result of early interventions (Li *et al*., 2003c, 2006; Tsai *et al*., 2009). Studies in Taiwan reported that less than a third of cases were identified among non-psychiatric inpatients in general hospitals and among severe mental illness inpatients in psychiatric inpatients, and primary care physicians were less likely to identify the alcohol abuse and dependence cases than psychiatrists did (Chen *et al*., 2004; Huang *et al*., 2009; Wu *et al*., 2008); however, related studies in mainland China and Hong Kong are rare. Four studies (Li *et al*., 2003b; Meng and Ge, 2005; Sun *et al*., 1998; Yen *et al*., 2008) reported that harmful drinking and alcohol dependence were associated with physical and psychosocial problems, life events, or poor insight into alcohol-related problems.

DISCUSSION

To the best of our knowledge, this review is the first effort to systematically synthesize the Chinese and English literature on the adaptations and utilization of the Chinese translations of AUDIT in China. Our review found that five teams from Beijing, Tibet, Taiwan and Hong Kong conducted region-specific programmes of translation, cultural adaptations, and tests of validity and reliability. Two kinds of adaptation were used to make the Chinese translations of the AUDIT culturally sensitive and relevant to each region. First, the studies in mainland China and Hong Kong made the AUDIT's first three questions culturally relevant to the local population by adjusting the wording to match the container-size or alcohol-content to reflect what is referred to in the standard English version as a 'standard drink' (Guo *et al*., 2008; Leung and Arthur, 2000; Li *et al*., 2003a). Second, our review also found appropriate inclusion of several minorities and dialects in some validated Chinese translations of the AUDIT, including Tibetan, Cantonese, Min-Nan Taiwanese and native language in indigent tribes in Taiwan (Guo *et al*., 2008; Leung and Arthur, 2000; Tsai *et al*., 2005; Yen *et al*., 2008; Zhou *et al*., 2005).

Regarding the performance of the Chinese translations of the AUDIT, two teams reported adequate validity (0.93–0.95) (Leung and Arthur, 2000; Tsai *et al*., 2005), three reported high reliability (0.95–0.99) (Chen *et al*., 2005a; Guo *et al*., 2008; Leung and Arthur, 2000), and two reported reasonable reliability (0.63–0.86) (Li *et al*., 2003a; Tsai *et al*., 2005). One study supported a single-factor solution (Leung and Arthur, 2000), whereas another supported a two-factor solution, each including five items (Guo *et al*., 2008). This is somewhat different from the pattern of loadings noted in a review of the recent western literature (Reinert and Allen, 2007). The validated Chinese translations of the AUDIT and its short versions with various cut-off points

generally demonstrated high sensitivity (0.880–0.997) and moderate specificity (0.709–0.934) for hazardous/harmful drinking and alcohol dependence. However, the specificity of the alcohol consumption questions for Min-Nan Taiwanese was low (0.58) for alcohol dependence. In addition, cited sources of Chinese translations of the AUDIT in several studies in mainland China and Taiwan did not report the validation process or the psychometric properties (Li et al., 2006; Ma et al., 1998; Meng and Ge, 2005; Sheng et al., 2009; Sun et al., 1998; Zhou et al., 2005). One study used a questionnaire from the national collaborative group, and reported moderate sensitivity (0.66–0.79) and specificity (0.79–0.85) for alcohol dependence and abuse (He et al., 1997). Validation procedures of the Chinese translations of the AUDIT varied in the gold standard criterion employed. Most studies compared the AUDIT score with several diagnostic procedures, including ICD-10 (He et al., 1997; Li et al., 2003a; Tsai et al., 2005), DSM-IV (Chen et al., 2005a; Guo et al., 2008) and the SCAN diagnostic interview that covers both classification systems (Chen et al., 2004; Wu et al., 2008). In the absence of a commonly accepted 'gold standard', one study used a psychological test validation approach to examine construct validity (Leung and Arthur, 2000). None of the studies employed the longitudinal evaluation using all available data standard (Allen et al., 1997), a procedure that integrates both clinical and diagnostic information collected over a period of time.

This review found a reasonable amount of applied research on the Chinese translations of the AUDIT (Tables 1 and 2), which reported wide ranges of hazardous and harmful drinking (5.3–66.9%) and alcohol dependence (13.5–18.5%). The validated Chinese translations and others without citations or details of their validation process were most utilized in workplace- and hospital-settings in the mainland, Hong Kong and Taiwan for screening, brief intervention research and as a change measure for severity of alcohol involvement. Compared with several psychiatric instruments administrated in large samples in the national or regional levels (Collaborative Research Group on Alcoholism and Related Problems, 1992a, b; Hao et al., 1999, 2004; Kim et al., 2008), the AUDIT has only been used in one population-based epidemiologic survey in Tibet (Guo et al., 2008) and another survey in Mang minority in their villages in Yunan (Zhou et al., 2005). The validated Chinese translations of the AUDIT were applied by other teams in Taiwan and Hong Kong, but not in mainland China. Among 12 studies from the mainland, only one in Tibet was published in English, which partially contributed to the limited AUDIT data from mainland China in the English-language literature.

Alcohol use disorders among vulnerable Chinese populations, such as women, adolescents, the elderly and rural-to-urban migrants, require special attention due to consistent associations between alcohol use disorders and health risk (Li et al., 2010a, b; Zhou et al., 2003) and potential underreporting of drinking during pregnancy and Fetal Alcohol Spectrum Disorders in China (Drabble et al., 2011). No study used the AUDIT among rural-to-urban migrants in mainland China, Hong Kong or Taiwan. In 12 studies in mainland China, men were sampled, and they were all recruited from venue-based hospitals, universities and workplaces as well as communities in two studies (Guo et al., 2008; Zhou et al., 2005). Among four studies in mainland China including women (Guo et al., 2008; Li et al., 2006; Zhi et al., 2007; Zhou et al., 2005), only one (Li et al., 2006) used lower cut-off points of the AUDIT for early detection for women compared with men. No study reported its gender-specific sensitivity and specificity. Only two studies included adolescents (Meng and Ge, 2005; Zhi et al., 2007). No study focused on the elderly. However, the retired as well as people with a wide range of age (10–87 years) were included in two studies in Hong Kong (Leung and Arthur, 2000; Tang et al., 2005a). No study in Taiwan used the AUDIT among adolescents. Our review suggests the need to utilize the AUDIT to screen these vulnerable populations in China.

This review is subject to several limitations. First, unpublished studies or reports were not included. Because we could not search key words in the full-text articles, some articles on Chinese translations of the AUDIT could not be identified when they did not use 'China', 'Chinese' or 'AUDIT' in their abstracts or titles. Second, included studies had possible response bias due to response minimization or denial that is known to occur in research using self-report methods (Babor et al., 1990). Third, we did not synthesize or recommend specific cut-off points of the AUDIT score across studies due to the heterogeneity in target populations and research methods. Fourth, studies from Li et al. (2003a, b), Ma et al. (1998), Sun et al. (1998) and Chen et al. (2004, 2005a) were from the same samples but were counted as different studies in our table. Fifth, we could not directly contact every research team to request their instruments and clarify confusions in their texts. Therefore, we could not fill some blank cells in two tables or our text. Sixth, the utilization of the AUDIT was assessed in cross sectional or case-control study designs using convenience samples. Therefore, the generalizability of the findings summarized in this review to the diverse populations of China may be limited.

CONCLUSIONS

The results of this review lead us to several conclusions concerning further research using Chinese translations of the AUDIT. First, there is a growing amount of psychometric, epidemiologic and treatment research using Chinese translations of the AUDIT, much of it still unavailable in the English-language reviews (Berner et al., 2007; Reinert and Allen, 2002, 2007). Given the recent increase in burden of disease attributable to alcohol use in China, the use of an internationally comparable instrument such as the AUDIT in Chinese research presents a unique opportunity to expand clinical and epidemiologic knowledge about the rise and fall of alcohol problem epidemics in a nation representing 21% of the world's population.

Second, the apparently high prevalences of alcohol use disorders in China documented in epidemiologic research using the AUDIT calls for routine screening in population-based epidemiologic surveys, research in primary care settings, and research focusing on women, adolescents, rural-to-urban migrants, the elderly and minorities in various settings.

Third, although standardization and comparability are always desirable, it might not be appropriate to recommend one 'standard version' of the Chinese AUDIT. To the extent

that the existing versions have different wordings, they should be considered as different instruments, requiring careful documentation of their psychometric properties. Nevertheless, all of the versions considered here were validated against standard diagnostic criteria (e.g. ICD-10); so they should be comparable with other translations of AUDIT both within and outside China. Response bias could not be estimated; so it would be important to investigate the extent to which AUDIT scores are minimized in different samples by response minimization or denial (Babor *et al.*, 1990). In addition, it could be valuable to the international scientific community if the Chinese translations of the AUDIT were used more routinely and systematically to provide comparability with both Chinese research and with research in other countries.

Finally, as one of world's fastest growing economies, mainland China has much to contribute to global initiatives to monitor, study and control alcohol-related problems, as called for in the WHO's Global Strategy to reduce harmful use of alcohol (World Health Organization, 2010). The growing use of WHO's AUDIT instrument in China could be a promising vehicle to implement the Global Strategy in that nation.

REFERENCES

Allen JP, Litten RZ, Fertig JB *et al.* (1997) A review of research on the Alcohol Use Disorders Identification Test (AUDIT). *Alcohol Clin Exp Res* 21:613–9.

Allen JP, Reinert DF, Volk RJ. (2001) The alcohol use disorders identification test: an aid to recognition of alcohol problems in primary care patients. *Prev Med* 33:428–33.

Babor T, Grant M. (1989) From clinical research to secondary prevention: international collaboration in the development of the Alcohol Use Disorders Identification Test (AUDIT). *Alcohol Health Res World* 13:371–4.

Babor TF, Kadden RM. (2005) Screening and interventions for alcohol and drug problems in medical settings: what works? *J Trauma* 59:S80–7; discussion S94–100.

Babor TF, Brown J, Del Boca F. (1990) Validity of self-reports in applied research on addictive behaviors: fact or fiction? *Behav Assess* 12:5–31.

Babor T, de la Fuente J, Saunders JB *et al.* (1992) *The Alcohol Use Disorders Identification Test: Guidelines for Use in Primary Health Care (WHO Publication No. 92.4).* Geneva, Switzerland: World Health Organization.

Berner MM, Kriston L, Bentele M *et al.* (2007) The alcohol use disorders identification test for detecting at-risk drinking: a systematic review and meta-analysis. *J Stud Alcohol Drugs* 68:461–73.

Chen CH, Chen WJ, Cheng AT. (2004) Prevalence and identification of alcohol use disorders among nonpsychiatric inpatients in one general hospital. *Gen Hosp Psychiatry* 26:219–25.

Chen CH, Chen WJ, Cheng AT. (2005a) New approach to the validity of the alcohol use disorders identification test: stratum-specific likelihood ratios analysis. *Alcohol Clin Exp Res* 29:602–8.

Chen X, Tang X, Li X *et al.* (2005b) Use of the alcohol dependence scale among drinkers from a survey sample in China. *Alcohol Res* 10:237–45.

Chongqing VIP. (1993) About Chongqing VIP information. http://www.cqvip.com/about/about.shtml (30 August 2009, date last accessed). [in Chinese].

Collaborative Research Group on Alcoholism and Related Problems (1992a) Alcohol dependence in populations of four kinds of occupations in nine centres in China: Part I. Methodology and prevalence. *Chin J Ment Health* 112–5. [in Chinese].

Collaborative Research Group on Alcoholism and Related Problems (1992b) Alcohol dependence in populations of four kinds of occupations in nine centres in China: Part II. Psychological, physical and social damage in patients with alcohol dependence. *Chin J Ment Health* 116–8. [in Chinese].

Disease Control Priorities Project (2006) *Burden of Disease in China in 2001.* Washington, DC: Population Reference Bureau.

Drabble L, Poole N, Magri R *et al.* (2011) Conceiving risk, divergent responses: perspectives on the construction of risk of fetal alcohol spectrum disorders in six countries. *Substance Use Misuse* 46:943–58.

Edwards G, Arif A, Hadgson R. (1981) Nomenclature and classification of drug- and alcohol-related problems: a WHO Memorandum. *Bull World Health Organ* 59:225–42.

Guo L, Zhang M. (1993) *Psychiatric Medicine.* Shanghai: Shanghai Medical University Publisher, 123–56. [in Chinese].

Guo W, Lanzi G, Luobu O *et al.* (2008) An epidemiological survey of alcohol use disorders in a Tibetan population. *Psychiatry Res* 159:56–66.

Hao W, Young DS, He M. (1995) Alcohol drinking in China: present, future and policy. *Chin J Clin Psychol* 3:243–8. [in Chinese].

Hao W, Derson Y, Xiao S *et al.* (1999) Alcohol consumption and alcohol-related problems: Chinese experience from six area samples, 1994. *Addiction* 94:1467–76.

Hao W, Su Z, Liu B *et al.* (2004) Drinking and drinking patterns and health status in the general population of five areas of China. *Alcohol Alcohol* 39:43–52.

Hao W, Chen H, Su Z. (2005) China: alcohol today. *Addiction* 100:737–41.

Hao W, Su Z, Chen H. (2007) Drinking and drinking-related problems in China. *Nihon Arukoru Yakubutsu Igakkai Zasshi* 42:595–601.

He J, Liang C, Li R. (1997) Utilization of AUDIT and investigation of its cut-off point. *Shangdong Psychiatry* 10:34–5. [in Chinese].

Huang MC, Yu CH, Chen CT *et al.* (2009) Prevalence and identification of alcohol use disorders among severe mental illness inpatients in Taiwan. *Psychiatry Clin Neurosci* 63:94–100.

Kawada T, Inagaki H, Kuratomi Y. (2010) The alcohol use disorders identification test: reliability study of the Japanese version. *Alcohol* 45:205–7.

Kim JH, Lee S, Chow J *et al.* (2008) Prevalence and the factors associated with binge drinking, alcohol abuse, and alcohol dependence: a population-based study of Chinese adults in Hong Kong. *Alcohol Alcohol* 43:360–70.

Lee S, Guo WJ, Tsang A *et al.* (2009) Associations of cohort and socio-demographic correlates with transitions from alcohol use to disorders and remission in metropolitan China. *Addiction* 104:1313–23.

Leung SF, Arthur D. (2000) The alcohol use disorders identification test (AUDIT): validation of an instrument for enhancing nursing practice in Hong Kong. *Int J Nurs Stud* 37:57–64.

Li B, Sheng Y, Zhang B *et al.* (2003a) The test of AUDIT in China. *Chin Ment Health J* 17:1–3. [in Chinese].

Li B, Yu X, Zheng X *et al.* (2003b) The differences of physical and psychosocial damages among alcohol dependence, hazardous and harmful drinking and social drinking groups. *Chin Ment Health J* 17:4–7,3. [in Chinese].

Li B, Zhang B, Sheng Y *et al.* (2003c) Early intervention on hazardous and harmful drinking. *Chin Ment Health J* 17:8–11. [in Chinese].

Li Z, Arthur D, Wu X *et al.* (2006) The effect of a brief interven-
tion for problem drinkers in a Beijing general hospital: a ran-
domized controlled trial. *Chin J Nurs* **41**:585–8. [in Chinese].

Li Q, Li X, Stanton B. (2010a) Alcohol use among female sex
workers and male clients: an integrative review of global litera-
ture. *Alcohol Alcohol* **45**:188–99.

Li Q, Li X, Stanton B. (2010b) Alcohol use and sexual risk beha-
viors and outcomes in China: a literature review. *AIDS Behav*
12:1227–36.

Ma J, Sun Y, Li H *et al.* (1998) Epidemiological study of alcohol
dependence among male workers in integrated iron and steel
works in Anhui. *Chin J Behav Med Sci* **7**:120–1. [in Chinese].

Mathers CD, Lopez AD, Murray CJL. (2006) The burden of
disease and mortality by condition: data, methods, and results
for 2001. In Lopez AD, Mathers CD, Ezzati M, Jamison DT,
Murray CJL (eds). *Global Burden of Disease and Risk Factors*.
New York: Oxford University Press, 45–240.

Meng X, Ge Y. (2005) Correlation between drinking and life events
among male students in middle school. *Chin J Health Educ* **21**:46–8.
[in Chinese].

Moussas G, Dadouti G, Douzenis A *et al.* (2009) The Alcohol Use
Disorders Identification Test (AUDIT): reliability and validity of
the Greek version. *Ann Gen Psychiatry* **8**:11.

Nayak MB, Bond JC, Cherpitel C *et al.* (2009) Detecting alcohol-
related problems in developing countries: a comparison of 2
screening measures in India. *Alcohol Clin Exp Res* **33**:2057–66.

Rehm J, Mathers C, Popova S *et al.* (2009) Global burden of
disease and injury and economic cost attributable to alcohol use
and alcohol-use disorders. *Lancet* **373**:2223–33.

Reid MC, Fiellin DA, O'Connor PG. (1999) Hazardous and harmful
alcohol consumption in primary care. *Arch Intern Med* **159**:1681–9.

Reinert DF, Allen JP. (2002) The Alcohol Use Disorders
Identification Test (AUDIT): a review of recent research.
Alcohol Clin Exp Res **26**:272–9.

Reinert DF, Allen JP. (2007) The alcohol use disorders identifi-
cation test: an update of research findings. *Alcohol Clin Exp Res*
31:185–99.

Santis R, Garmendia ML, Acuna G *et al.* (2009) The Alcohol Use
Disorders Identification Test (AUDIT) as a screening instrument
for adolescents. *Drug Alcohol Depend* **103**:155–8.

Saunders JB, Conigrave KM. (1990) Early identification of alcohol
problems. *CMAJ* **143**:1060–9.

Saunders JB, Aasland OG, Babor TF *et al.* (1993) Development of
the Alcohol Use Disorders Identification Test (AUDIT): WHO
Collaborative Project on Early Detection of Persons with
Harmful Alcohol Consumption—II. *Addiction* **88**:791–804.

Sheng B, Zhu J, Yuan G *et al.* (2009) Primary investigation of the
relationship between somatic disease and smoking and alcohol
drinking in fishermen on sailing. *Med J Commun* **23**:252–7.
[in Chinese].

Sun Y, Ma J, Chao D *et al.* (1998) An investigation of the
influence of alcohol dependence on mental health among
male workers in an iron and steel complex. *Chin J Ergon*
4:32–3. [in Chinese].

Tang WK, Lum CM, Ungvari GS *et al.* (2005a) Alcohol consump-
tion, lung function, and quality of life in pneumoconiosis.
Alcohol Clin Exp Res **29**:1230–6.

Tang X, Chen X, Li H *et al.* (2005b) Smoking and drinking pat-
terns among residents of Li ethnic minority villages in Hainan,
China. *Subst Use Misuse* **40**:687–701.

Tsai MC, Tsai YF, Chen CY *et al.* (2005) Alcohol Use Disorders
Identification Test (AUDIT): establishment of cut-off scores in a
hospitalized Chinese population. *Alcohol Clin Exp Res* **29**:
53–7.

Tsai YF, Tsai MC, Lin YP *et al.* (2009) Brief intervention for problem
drinkers in a Chinese population: a randomized controlled trial in a
hospital setting. *Alcohol Clin Exp Res* **33**:95–101.

Wang X, Wang X, Ma H. (1999) *Handbook of Psychological
Assessment*. Beijing: Chinese Mental Health Journal.
[in Chinese].

World Health Organization (2010) *Global strategy to reduce the
harmful use of alcohol*. Geneva: World Health Organization.
http://www.who.int/substance_abuse/msbalcstragegy.pdf   (16
February 2011, date last accessed).

Wu SI, Huang HC, Liu SI *et al.* (2008) Validation and comparison
of alcohol-screening instruments for identifying hazardous
drinking in hospitalized patients in Taiwan. *Alcohol Alcohol*
43:577–82.

Xue C. (1989) Alcohol use disorders identification test. *Shanghai
Psychiatry* **1**:45, 48. [in Chinese].

Yang MJ. (2002) The Chinese drinking problem: a review of the lit-
erature and its implication in a cross-cultural study. *Kaohsiung J
Med Sci* **18**:543–50.

Yen CF, Hsiao RC, Ries R *et al.* (2008) Insight into alcohol-related
problems and its associations with severity of alcohol consump-
tion, mental health status, race, and level of acculturation in
southern Taiwanese indigenous people with alcoholism. *Am J
Drug Alcohol Abuse* **34**:553–61.

Zhang LF, Zhao LC, Zhou BF *et al.* (2004) Alcohol consumption
and incidence of ischemic stroke in male Chinese. *Chin J
Epidemiol* **25**:954–7. [in Chinese].

Zhi S, Zhang J, Yang X *et al.* (2007) University students' expec-
tation structure and behavior of drinking wine. *Contemp Young
Res* **4**:76–80. [in Chinese].

Zhou H, Deng J, Li J *et al.* (2003) Study of the relationship
between cigarette smoking, alcohol drinking and cognitive
impairment among elderly people in China. *Age Ageing*
32:205–10.

Zhou C, Huang G, Yang M. (2005) Investigation of alcohol use
among Mang minority in Jinping, Yunan. *Chin J Drug Abuse
Prev Treat* **11**:198–200. [in Chinese].

Zhou L, Conner KR, Phillips MR *et al.* (2009) Epidemiology of
alcohol abuse and dependence in rural Chinese men. *Alcohol
Clin Exp Res* **33**:1770–6.