The Role of Sociodemographic Factors in the Risk of Transition from Alcohol Use to Disorders and Remission in Singapore

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Abstract — Aims: The aim of the study was to define predictors of transition from alcohol use to disorders, and their remission, among adults residing in Singapore. Methods: The Singapore Mental Health Study was a cross-sectional survey conducted from December 2009 to December 2010. Information on alcohol use, regular use, DSM-IV criteria for abuse and dependence, and remission among 6616 respondents was obtained with the Composite International Diagnostic Interview. Results: The prevalence of lifetime alcohol use (drinking at least once in the lifetime) and regular use (ever drinking at least 12 drinks in a 12-month period) was 66.6 and 32%, respectively. Of the regular drinkers, 10.1% progressed into alcohol abuse; 6.9% of abusers turned to alcohol dependence and 16.6 and 7.1% of those with history of alcohol abuse and/or dependence subsequently reported remission defined as cessation of alcohol use and the absence of any symptoms for at least 2 years before interview. Transitions to regular use and to dependence were associated with younger age, Indian ethnicity and an early age of onset of drinking, and women had a higher risk than men of transition from abuse to dependence. Remissions were associated with older age, Malay ethnicity and late age of onset. Conclusion: The rates of alcohol use and transition to disorders were lower than in other developing countries that have been studied. Sociodemographic predictors include younger age of onset of drinking, something that intervention programs and preventive strategies in Singapore should note.

INTRODUCTION

The transition from a first time drinker to a regular drinker and then on to abuse or dependence is important to understand for theoretical as well as a public health reasons. One such attempt was the nationally representative survey in the USA, the National Comorbidity Survey Replication (NCS-R), conducted between 2001 and April 2003, which reported that of the National Comorbidity Survey Replication (NCS-R), conducted between 2001 and April 2003, which reported that of the respondents who had at least a sip of alcohol at the 91.7% of respondents who had at least a sip of alcohol at the 91.7% of respondents who had at least a sip of alcohol at the 91.7% of respondents who had at least a sip of alcohol at the

MATERIALS AND METHODS

Sample

The SMHS was a nationally representative survey of the adult Singapore Resident population aged 18 years and above. Using a disproportionate stratified sampling, the three main ethnic groups (Chinese, Malays and Indians) were sampled in equivalent proportion of about 30% each rather than in proportion to the ethnic distribution in the general population to address the possibility of not getting an adequate sample in minority ethnic groups to accurately establish the prevalence of an uncommon disorder. The respondents were randomly selected from a National registry that maintains the names and other sociodemographic details such as age, gender and ethnicity, and household addresses of all residents in Singapore. The respondents were approached at the household address provided by the registry. Those residents who were incapable
of doing an interview due to severe physical or mental health conditions, language barriers, living outside the country, institutionalized or hospitalized at the time of the survey, and those who were not contactable due to incomplete or incorrect address were excluded from the survey.

The study was approved by the relevant institutional ethics committee (National Healthcare Group, Domain Specific Review Board) and written informed consent was obtained from all participants. Parents/guardians gave written informed consent for those respondents who were <21 years of age. Face-to-face interviews were conducted by professional survey interviewers from 1 December 2009 to 5 December 2010. Completed interviews were obtained from 6616 respondents—giving a survey response rate of 75.9%. The study methodology has been described in detail in an earlier article (Subramaniam et al., 2012a).

Measures

The diagnosis of alcohol use disorder, i.e. alcohol abuse and alcohol dependence, was established using the Composite International Diagnostic Interview (CIDI) Version 3.0 (Kessler and Ustun, 2004). As alcohol abuse is often a stage in the transition to dependence, non-hierarchical algorithms were used to generate the diagnosis for alcohol abuse and dependence. If the respondents reported ever drinking, a series of questions assessed drinking behavior and criteria for DSM-IV alcohol abuse and dependence. Respondents who met DSM-IV lifetime criteria for alcohol abuse and dependence were questioned further to establish onset, course and recency of the illness. The alcohol module includes a number of questions related to age-of-onset (AOO) such as those pertaining to AOO of alcohol use (‘How old were you the very first time you ever drank an alcohol beverage’), AOO of regular drinking (‘How old were you when you first started drinking at least 12 drinks in a year’) and AOO of alcohol abuse and dependence. The AOO of alcohol abuse was defined as the age at which any symptoms of abuse first occurred (‘How old were you the very first time you had any of these problems’), while the AOO of alcohol dependence was defined as the age at which three or more of the seven symptoms of dependence first occurred (‘How old were you the very first time you had three (or more) of these problems’). Additional transition-related variables such as regular use among alcohol users, alcohol abuse among regular alcohol users and alcohol dependence among alcohol abusers were calculated by taking the AOO of the earlier stage of alcohol use and subtracting it from the age of onset of the later stage. Remission was defined as the cessation of alcohol use and the absence of any symptoms for at least 2 years before interview (Kalaydjian et al., 2009). Five alcohol-related variables that represent five stages of alcohol use and transition to disorder and remission namely alcohol use, regular use among ever use, abuse among regular use, dependence among abuse and remission among abuse and dependence were treated as main outcomes, while sociodemographic data that were captured using a structured questionnaire such as age, gender and ethnicity were included as predictors in current study.

Statistical analyses

Statistical analyses were carried out using the Statistical Analysis Software (SAS) System version 9.2. To ensure that the survey findings were representative of the Singapore population, the data were weighted to adjust for over-sampling and post-stratified by age and ethnicity distributions between the survey sample and the Singapore resident population in 2007. Descriptive statistics of different stages of alcohol use comprised of alcohol use, regular use among ever use, abuse among regular use, alcohol dependence among abuse and remission among abuse and dependence were determined by cross-tabulation analysis. Projections of cumulative lifetime probability of alcohol use, regular use, abuse and dependence from year of onset were obtained by the life table method. Cumulative age of onset distributions were also estimated separately across birth of cohorts using life table method implemented in SAS version 9.2 (Heeringa et al., 2010). Predictors of alcohol use and its transition to disorders and remission were examined using multivariate discrete-time survival analyses. Age of cohort, gender and ethnicity variables was treated as time-invariant predictors while age of onset has been treated as a time-varying predictor for multivariate discrete-time survival analyses. A series of multivariate discrete-time survival models were conducted to predict transition to different stages of alcohol use. All survival models included age of cohort, gender, ethnicity, AOO of first use and AOO of regular use variables as predictors. However, as the validity of the model fit was poor when all these variables were included, we only chose the most parsimonious model while reporting the final findings. Odds ratios were obtained by exponentiating survival coefficients. Standard errors (SE) were estimated using the Taylor series linearization method. Multivariate significance tests in the discrete-time survival analyses were evaluated using χ² tests based on design corrected coefficient variance–covariance matrices. Statistical significance was evaluated at the <0.05 level using two-sided tests.

RESULTS

A total of 6616 respondents completed the study and constituted a representative sample of the adult resident population in Singapore. The weighted mean (SD) age of the sample was 42 (14.5) years. There were slightly more females (51.5%) than males (48.5%). Majority of the respondents were Chinese (76.9%) followed by Malays (12.3%), Indians (8.3%) and those of other ethnic groups (Other) (2.4%), respectively.

Prevalence of lifetime alcohol use and the transition to abuse, dependence and remission

More than half of the respondents (66.6%, 95% CI = 65.1–68.1) reported that they had ever had an alcoholic drink at some time in their life. Thirty-two percent (95% CI = 30.4–33.6) reported using alcohol regularly (those who drank alcoholic beverages at least 12 times in 12 months). Among alcohol users, 46.8% (95% CI = 44.6–49.0) of them made the transition to being regular users; 10.1% (95% CI = 8.3–11.8) of regular users subsequently met criteria for lifetime alcohol abuse and 6.9% (95% CI = 3.1–10.7) of lifetime abusers turned to alcohol dependence. Of those who met criteria for lifetime abuse and dependence, only 16.6% (95% CI = 10.0–23.2) and 7.1% (95% CI = 0.2–14.0) had remitted.
Age of onset

Figure 1 (reproduced from Subramaniam et al., 2012b) shows the cumulative curve age of onset of each alcohol use, regular use, abuse and dependence. The cumulative age of onsets of alcohol use and regular use peaked between the early teens and late 20s. For abuse and dependence, modest increase occurred in the early 20s.

Cohort effect

Figure 2a–d (reproduced from Subramaniam et al., 2012b) shows the cumulative age of onset for alcohol use, regular use and abuse and dependence by cohort. The risk of alcohol use, regular use, abuse and dependence were higher among younger (aged 18–34 years) when compared with older age group (aged 65 years and above). For example, 48.1% of the youngest had used alcohol regularly when compared with only 22.6% of the oldest age group.

Sociodemographic predictors of transition from alcohol use to disorder and remission

Table 1 shows the sociodemographic predictors of alcohol use and the transition from alcohol use to disorder and remission using the multivariate discrete-time survival analyses. Those aged 18–64 years (vs. aged 65+ years), men and belonging to ‘Other’ ethnicity were significantly associated with an increased risk of alcohol use, while Indian and Malay ethnicity (reference group = Chinese ethnicity) were associated with lower risk. Risk of regular use among ever users was found to be significantly higher in those aged 18–64 years, men, those of Indian or Other ethnicity and early AOO of first alcohol use, while Malay ethnicity was significantly associated with lower risk. Risk of alcohol abuse among regular users was significantly higher among men, among those with early AOO of first alcohol use, Malay, Indian and Other ethnicity, while age was not a significant factor. Risk of alcohol dependence among regular users was significantly higher among men, among those with early AOO of alcohol use, Malay, Indian and Other ethnicity and those aged 18–49, while those aged 50–64 were significantly associated with lower risk. Risk of transition to alcohol dependence among abusers was higher among those belonging to Indian and Other ethnicity, early AOO of regular use and those aged 18–34 years, while men aged 50–64 years were significantly associated with lower risk.

Women had a higher risk than men of transition from abuse to dependence. To examine whether this was influenced by age, we tested the interaction effect of age and gender, and found that the interaction effect was not statistically significant. We found that remission from alcohol abuse and dependence was predicted by Malay ethnicity and later AOO of alcohol abuse, while those aged 18–49 years and Other ethnicity were significantly associated with poor remission.

DISCUSSION

The prevalence of lifetime regular use and alcohol use disorder (those who met criteria for abuse and dependence) among adult resident population in Singapore was 32 and 3.6%, respectively. Our rates are lower than those reported from the USA (72.9% reported regular use, 18.6% with lifetime alcohol use disorder) (Kalaydjian et al., 2009), Brazil (56.2% with regular use, 14.2% with lifetime alcohol use disorder) (Silveira et al., 2011), South Africa (34% with regular use, 14% lifetime with alcohol use disorder) (Suliman et al., 2010) and China (39.5% with regular use, 5.5% with lifetime alcohol use disorder) (Lee et al., 2009). The rates of transition from alcohol use to regular use and transition from regular use to alcohol abuse and dependence were also lower compared with other studies (Kalaydjian et al., 2009; Lee et al., 2009; Suliman et al., 2010; Silveira et al., 2011). The low rates of alcohol use and transition from use to disorder in this Asian multiracial population is reflected in the relatively low consumption of alcoholic beverages in Singapore, which in 2005 was 0.55 l of pure alcohol per adult (15 years or older)—cf. developed countries like the US (8.44 l), UK (11.67 l), Australia (9.89 l) and Japan (7.83 l) (World Health Organization, 2011).

Our study showed that alcohol use and transition to regular use and dependence were commoner in younger men, as found in several other population-based studies (Kalaydjian et al., 2009; Lee et al., 2009, Suliman et al., 2010; Silveira et al., 2011). The higher risk of alcohol use and transition to regular use and dependence among the younger men in this sample may be a cohort effect, as suggested by the longitudinal data on binge drinkers in Singapore (Lim et al., 2007), and points toward an evolving drinking culture in Singapore (Lim et al., 2007). Lee et al. (2009) found that alcohol use and disorders were more common in younger than older cohorts and the most recent cohort started to drink and drink regularly at an especially early age.

Few studies have examined the relationship between ethnicity and risk of alcohol transitions. In our study, the effect of ethnicity varied across different stages of alcohol use to disorders: compared with the Chinese, Indians and those of Other ethnicity were associated with higher risk of transition from regular use to dependence. Studies in other multi-ethnic populations have also found a higher rate of alcohol abuse and dependence among Indians compared with Chinese (Saroja and Kyaw, 1993; Maniam, 1994; Jernigan and Indran, 1997). Possible explanations include social, cultural and religious differences in attitudes toward alcohol, the quantities of alcohol consumed by different ethnic groups, and genetic differences in the metabolism and effects of alcohol (Douds et al., 2003). Studies in molecular genetics have shown that genetic polymorphism related to alcohol metabolic pathways might protect a large proportion of Chinese people from heavy drinking (Dick and Foroud, 2003; Higuchi et al., 2006; Zintzaras et al., 2006). Malay ethnicity was significantly associated with lower risk of transition to regular use but higher risk of transition to alcohol abuse and dependence. As almost all the Malays in Singapore are Muslims, the lower risk of alcohol use and transition to regular use is due probably to Islamic injunctions against alcohol use. Among drinkers, we found that Malays showed significantly higher risk of transition to alcohol abuse and dependence. Maniam (1994) has reported that despite the small number of Malay drinkers, Malays who drank alcohol reported higher levels of consumption than average drinkers in other ethnic groups. This author argued that although alcohol is taboo in Malay culture, once this culture barrier is crossed, Malays will consume as much, if not more, than other ethnic groups (Maniam, 1994).

Men had a higher risk of transition to regular use and from regular use to abuse and dependence than women. This
association was consistently found in previous studies (Kalaydjian et al., 2009; Lee et al., 2009; Suliman et al., 2010; Silveira et al., 2011). Interestingly, our findings showed that women were significantly associated with high risk of transition from abuse to dependence. This has not been observed in previous population-based studies (Kalaydjian et al., 2009; Lee et al., 2009; Lopez-Quintero et al., 2011; Silveira et al., 2011).

‘Telescoping effect’ may explain the higher risk of transition to dependence among Asian women drinkers. Zilberman et al. (2003) reviewed the literature about gender differences in prevalence estimates and course of alcohol and other substance-related disorders and concluded that although women initiated drinking at a later age than men, women progressed faster than men to alcohol dependence and treatment (Zilberman et al., 2003). The course of alcohol disorder is thus considered to be compressed, or ‘telescoped’, in women compared with men, with a later age at initiation of alcohol use but shorter duration from use to dependence and treatment (Keyes et al., 2010). Lim et al. (2007) reported that the level of regular drinking has declined in men but increased in women in Singapore, especially in those aged 18–29 and 30–49 years. The risk of transition from abuse to dependence among women may be related to the popularity of binge drinking among young Singaporean women since the increase in frequency of drinking was most pronounced among younger women aged between 18–19 and 30–49 years (Lim et al., 2007). (Binge drinking is frequently defined as the consumption of four or more drinks at a single sitting for women, and of five or more drinks at a single sitting for men—e.g. Wechsler and Nelson, 2001).

We found that those with early AOO were at higher risk of transition from alcohol use to abuse and dependence. This was consistent with several studies (Kalaydjian et al., 2009, Suliman et al., 2010; Silveira et al., 2011). McGorry et al.
Table 1. Predictors of alcohol use, transition to regular, abuse, dependence and remission

<table>
<thead>
<tr>
<th></th>
<th>Ever users (n = 3358)</th>
<th>Regular user among ever users (n = 1762)</th>
<th>Abuser among regular users (n = 233)</th>
<th>Dependence among regular users (n = 41)</th>
<th>Dependence among abusers (n = 25)</th>
<th>Remission among abuser and dependent (n = 48)</th>
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<td>Age group</td>
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<tr>
<td>18–34</td>
<td>3.93 (3.67, 4.22)*</td>
<td>1.57 (1.44, 1.71)*</td>
<td>1.01 (0.83, 1.22)</td>
<td>7.41 (4.85, 11.32)*</td>
<td>2.08 (1.34, 3.24)*</td>
<td>0.09 (0.05, 0.14)*</td>
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<td>35–49</td>
<td>2.2 (1.87, 2.14)*</td>
<td>1.15 (1.05, 1.25)*</td>
<td>0.89 (0.73, 1.07)</td>
<td>3.38 (2.21, 5.17)*</td>
<td>1.36 (0.85, 2.18)</td>
<td>0.18 (0.11, 0.28)*</td>
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<tr>
<td>50–64</td>
<td>1.51 (1.41, 1.66)*</td>
<td>1.26 (1.15, 1.37)*</td>
<td>0.92 (0.75, 1.13)</td>
<td>0.26 (0.15, 0.42)*</td>
<td>0.18 (0.11, 0.30)*</td>
<td>0.77 (0.49, 1.21)*</td>
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<td>65+</td>
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<td>Ethnicity</td>
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<td>Chinese</td>
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<td>Malay</td>
<td>0.07 (0.06, 0.074)*</td>
<td>0.77 (0.74, 0.80)*</td>
<td>2.04 (1.88, 2.21)*</td>
<td>1.57 (1.21, 2.03)*</td>
<td>0.64 (0.40, 1.02)</td>
<td>9.3 (7.66, 11.29)*</td>
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<tr>
<td>Indian</td>
<td>0.29 (0.28, 0.30)*</td>
<td>1.46 (1.41, 1.51)*</td>
<td>2.16 (2.00, 2.32)*</td>
<td>5.38 (4.42, 6.54)*</td>
<td>8.4 (6.37, 11.07)*</td>
<td>1.02 (0.82, 1.26)</td>
</tr>
<tr>
<td>Others</td>
<td>1.52 (1.41, 1.65)*</td>
<td>7.58 (6.96, 8.24)*</td>
<td>2.29 (2.07, 2.53)*</td>
<td>10.08 (8.09, 12.56)*</td>
<td>4.79 (3.41, 6.73)*</td>
<td>0.37 (0.27, 0.51)*</td>
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<tr>
<td>Gender</td>
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<tr>
<td>Male</td>
<td>3.03 (2.93, 3.14)*</td>
<td>2.65 (2.54, 2.76)*</td>
<td>2.84 (2.58, 3.14)*</td>
<td>1.6 (1.31, 1.97)*</td>
<td>0.62 (0.49, 0.78)*</td>
<td>0.76 (0.55, 1.05)</td>
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<td>Female</td>
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<td>Age of onset of first use</td>
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<td>Age of onset of abuse</td>
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ORs are based on multivariate discrete-time survival model with person-year as the unit of analysis.
OR, Odds ratio; CI, confidence interval.
*Significant level was set at P-value <0.05.

(2011) reported that alcohol abuse and dependence are most likely to start in the late adolescence and early adulthood. DeWit et al. (2000) reported that although individuals who begin using alcohol in the pre- and early adolescent years (ages 11–14) are most vulnerable to the risk of alcohol disorders, having a first drink before the age of 11 did not elevate the risk of developing an alcohol disorder for 6 years after initiating use. In fact, it was only until 6–8 years after the first year drink that rapid upward progression to disorders occurred. DeWit et al. (2000) concluded that young people who drink alcohol early in their life are less likely to have access to large quantities, which happens at a time when most have entered adolescence and are become exposed to peer influences (i.e. a greater availability of alcohol and more pressure to use) (DeWit et al., 2000).

Older age, Malay ethnicity and late AOO of alcohol abuse were associated with remission from abuse and dependence. Considering early AOO of alcohol use as a marker of alcohol severity, some authors (Kandel et al., 1997; Lee et al., 2009; Silveira et al., 2011) have suggested that a later AOO of alcohol abuse increased the chance of remission.

There are several limitations to interpreting the results of our study. The findings were based on a household survey that did not include those who were institutionalized. It is possible that the rates of alcohol use and transition to abuse and dependence in these populations are higher than those residing in the community. There could also be an element of recall bias in this retrospective study because age at first use and the age at onset of alcohol problems may have occurred many years ago and respondents may have problems in recalling these details. In this study, retrospective age at onset and remission of AUD were obtained from CIDI age-of-onset question series (Kessler et al., 2007). Previous studies have shown that the test–retest reliability of the self-report measures of the retrospective age at onset question was moderate (Johnson and Mott, 2001; Parra et al., 2003). There might be under-reporting of alcohol use disorder in this sample especially among those of Malay ethnicity—alcohol use is a sensitive issue, being forbidden in Islam, which is the predominant religion of this ethnic group in Singapore.

These limitations notwithstanding, the strengths of our study are that it is a nation-wide survey of a representative multi-ethnic population that examined alcohol use disorders using a structured diagnostic instrument with face-to-face interviews, and diagnoses of alcohol abuse and dependence were made according to DSM-IV criteria.

CONCLUSIONS

The prevalence of alcohol use and transitions from use to regular, abuse and dependence in Singapore were lower than those reported from studies conducted in largely Western populations, and Asian countries such as in China. Alcohol use and transition to regular use and abuse were more common among men than women as well as young adults. Our findings also highlight the importance of sociodemographic predictors across stages of alcohol use especially that of age of onset of drinking, i.e. younger AOO increased the risk of transition to alcohol disorders while later of AOO increased chance of remission. We also found that gender plays a significant role: women have a higher risk than men of transition from abuse to dependence. Future intervention programs and preventive strategies in Singapore should take these findings into consideration.

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