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Relationship Between Alcohol Drinking and Alcohol-related Health Problems[1]

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Objective To study the relationship between drinking environment, attitudes and situation and alcohol-related health problems. **Methods** A sample of 2327 respondents was randomly collected from Wuhan, Hubei Province in China by a face-to-face interview. The structural equation modeling analysis was performed for the data collected. **Results** Both parents' drinking behaviors and respondents' drinking situation strongly impacted the alcohol-related problems and diseases. Friends' or peers' drinking behaviors influenced the respondents' drinking attitudes and behaviors. Males experienced more alcohol-related problems and diseases than females. **Conclusions** Comparatively, parents' drinking behaviors exert the most significant influence on drinkers. Therefore, it is beneficial to restrict parents' drinking behaviors for the offsprings and the whole society, and an intensive professional education in early motherhood is also necessary for Chinese women.

Key words: Structural equation modeling; Latent variable; Current drinker

INTRODUCTION

In China, alcohol drinking is closely associated with the human life, and there is a large population of drinkers consuming a formidable volume of alcohol. It is clearly that since the economic reform started from 1978 in China, the national alcohol consumption has increased rapidly. For example, the national consumption of alcohol beverage was 0.67 million tons in 1957, 2.47 million tons in 1978, 13.57 million tons in 1988 and 28.34 million tons in 1998[1]. The per capita (adult) consumption of alcohol beverage was increased from about 1 kg in 1957 to 3 kg in 1978, 16 kg in 1988, 29 kg in 1998. The per capita consumption of beer was increased from about 0.1 kg in 1957 to 0.6 kg in 1978, 8 kg in 1988 and 21 kg in 1998. The beer consumption in China is close to that in many economically developed countries, such as USA, Canada, etc.[2,3]. The substantial increase of alcohol consumption in China has attracted worldwide attentions.

As in other countries in the world, many alcohol-related health problems have been occurring in China[4,5]. Therefore, studying the risk factors that cause the alcohol-related health problems is an important task for medical researchers.

The aim of the present study was to explore the relationship between alcohol drinking and related health problems by adopting a structural equation modeling analysis.

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METHODS

Sampling

The target of the present study was restricted to the people aged 15-65 years living in the urban area of Wuhan City, the capital of Hubei Province in China. Procedures of stratified clustering random sampling were employed in the study. A sample of 2 327 people was randomly drawn from 8 natural districts in Wuhan City. The sample size in each stratum and in each age group of males and females was very close to the distribution of Wuhan urban population. In addition, the distribution of the occupational data was also matched with the population data[6].

With the help of the community centers, the response rate of the face-to-face interviews was 88.5%. Because there was a very small design-effect caused by the clustering stratified random sampling procedure, the analyses used in the present study were based on the general assumption of a simple random sample.

Data

The questionnaire used in the face-to-face interviews consisted of 5 parts of questions, including personal information, self-reported drinking behaviors, alcohol-related problems, drinking environment and attitudes.

From exploratory factor analysis, there were 20 manifest variables hided in 6 latent variables that were used in the structural equation modeling (SEM) analysis. These variables and the codes are listed in Table 1.

There were 12 scales to measure the drinking frequency in the questionnaire, these were once a year, 2-3 times a year, 4-5 times a year, once every two months, once a month, twice a month, once a week, twice a week, 3-4 times a week, 5-6 times a week, once every day, two times or more every day. A true value was used to represent the number of times of drinking in the analysis.

To calculate the average daily drinking amount, the absolute volume of alcohol consumed in a typical occasion was estimated. In the survey, the number of bottles of beer, wine and spirits used in a typical occasion was asked, and the ethanol content was taken as 4.5% for beer, 12% for wine and 40% for any spirits (the variation from 30% to 60% in China). The volume of beer was 640 mL per bottle (the production of beer with 640 mL per bottle accounting for 94% in China[1]). The volume of wine and spirits was 640 mL and 500 mL per bottle, respectively. The annual alcohol consumption was calculated by multiplying the typical quantity by the annual drinking frequency. Then, the average daily drinking amount equaled to the annual consumption divided by 365.

For personal background, only gender and age were used in the present analysis and these two variables were treated as no-measure-error variables.

Statistical Analysis

Exploratory factor analysis was adopted to explore the latent and manifest variables by employing the FACTOR procedure from the SAS statistics software package (SAS Institute Inc, 1995). The confirmatory factor analysis was adopted to explore the correlations among these latent variables. The structural equation modeling analysis was adopted to detect the causal relationship among these 6 latent variables by employing the CALIS procedure from the SAS statistics software package. In addition, in order to reduce the variations, both the frequency of drinking and the daily consumption were taken as logarithm transformation.

TABLE 1

Variables and Codes Used in SEM Analysis

Latent Variables	Manifest Variables	Codes of Variables
Parents' Drinking Behaviors	Y1: Does Your Father Drink Alcohol? Y2: Does Your Mother Drink Alcohol?	1=Never Drinks, 2=Occasionally Drinks, 3=Frequently Drinks, 4=Almost Every Day Drinks.
Friends/ Fellows' Drinking Behaviors	Y3: Do Your Good Friends Like Drinking Alcohol? Y4: Do Your Schoolfellows or Colleagues Like Drinking Alcohol?	1=None Like, 2=Few Like, 3=Most of Them Like, 4=All Like.
Attitudes to Alcohol Drinking	Y5: Drinkers Have More Friends Than Abstainers. Y6: Drinker's Social Ability Is More Efficient Than That of Non-drinkers. Y7: Thousands of Cups Are Still Not Enough When Drinking With Closed Friends. Y8: Drinking is A Good Way for Relax.	1=Agree, 0=Disagree.
Drinking Situation	Y9: The Frequency of Drinking Alcohol in the Last 12 Months. Y10: Average Daily Drinking Amount.	Frequency: Number of Times. Drinking Amount: Absolute Alcohol in mLs.
Alcohol-related Problems	Y11: Being Involved in a Serious Argument or Fighting After You Have Been Drunk. Y12: Taking an Alcohol Drink as the First Thing When You Get up in the Morning. Y13: Feeling Serious Hand Trembling in the Morning After Drinking. Y14: Stayed Intoxicated for Several Days at a Time. Y15: Unable to Go to Work or Study for a Few Days After Heavy Drinking. Y16: Being Involved in an Accident or Car Crash After Drinking.	0=Never, 1=Occasionally, 2=Sometimes, 3=Frequently.
Alcohol-related Diseases	Y17: High Blood Pressure. Y18: Heart Disease. Y19: Liver Disease. Y20: Stomach Disease.	1=No Problems, 2=Yes, But Not Too Serious, 3=Serious.
Gender	Sex:	1=Male, 2=Female
Age	Age:	Age in Years

The reason for adopting a structural equation modeling analysis in the present paper, rather then the multiple linear regression analysis was that it could solve the problem of multi-collinearity among the independent variables occurred in the multiple linear regression analysis, detect the indirect effect between variables rather than the direct effects by multiple linear regression analysis, and analyze the relationship between a few important latent variables rather than many measurable variables.

RESULTS

Of the 2 327 respondents, 1 587 (68.20%) were current drinkers, i.e, they drank in the last 12 months. The annual drinking frequency for male, female and all current drinkers was 138 (median=52) times, 27 (median=4.5) times and 101 (median=12) times, respectively. The per capita annual consumption of absolute alcohol for male, female and all current drinkers was about 13.2 (median=3.0) liters, 2.1 (median=0.12) liters and 9.6 (median=0.7) liters, respectively.

The structural equation modeling analysis was based on all current drinkers with available data (n=1 495) in the sample. The Chi-square for the model fitting was 137.15 with 135 degree of freedom and P-value was 0.4322. The goodness of fit index (GFI) was 0.9918 and the GFI adjusted for degree of freedom (AGFI) was 0.9847. The root mean square residual (RMR) was 0.0386. The root mean square error of approximation (RMSEA) was 0.0033 (its 90% up confident limit was 0.0130). The estimate of cross-validation index (ECVI) was 0.2482 (its 90% up confident limit is 0.2715). These important measures for the model assessment indicated that the structural equation model fit the data well. Tables 2 and 3

TABLE 2

Measurement Model for Latent Variables (n=1495)

Latent Variable: Manifest Variable	Unstandardized Coefficient	Standard Error	t-value	Standardized Coefficient
Parents' Drinking Situation:				
Father	1.0000			0.255
Mother	2.0700	0.4907	4.2183	0.750
Friends/fellows' Drinking Situation:				
Friends	1.0000			0.603
Fellows	1.1116	0.0783	14.1978	0.697
Drinking Attitudes:				
Drinkers Have More Friends	1.0000			0.523
Drinker's Social Ability Is More Efficient	0.8212	0.1231	6.6712	0.429
Thousands of Cups are Still Not Enough	1.2417	0.1013	12.2559	0.652
Drinking Is A Good Way for Relax	1.0401	0.0840	12.3783	0.541
Drinking Situation:				
Frequency of Drinking	1.0000			0.871
Amount of Daily Drinking	0.9099	0.0133	68.4827	0.868
Alcohol-related Problems:				
Involved in a Serious Quarrel /fighting	1.0000			0.660
Taken an Alcohol Drinking as the First Thing	0.6959	0.0624	11.1465	0.462
Feeling Serious Hands Trembling	0.9244	0.0393	23.5095	0.634
Stayed Intoxicated for Several Days	0.7677	0.0478	16.0744	0.589
Unable to Go to Work/study for a Few Days	0.9283	0.0470	19.7633	0.699
Involved in an Accident or Car Crash	0.6662	0.0341	19.5171	0.579
Alcohol-related Diseases:				
High Blood Pressure	1.0000			0.719
Heart Disease	0.3617	0.0431	8.3930	0.403
Liver Disease	0.4192	0.0475	8.8240	0.378
Stomach Disease	0.8591	0.0826	10.4032	0.512

show the results of the structural equation modeling analysis. The R^2 for each model also indicated that the overall model fitting was well.

Fig.1 shows the direct effects of the latent variables on the standardized coefficients.

TABLE 3

Structural Equation Model for Latent Variables (n=1495)

Dependent Latent Variable (R^2): Independent Latent Variables	Unstandardized Coefficient	Standard Error	t-value	Standardized Coefficient
Friends/fellows' Drinking Situation (0.05):				
Age	0.0073	0.0013	5.5631	0.214
Drinking Attitudes (0.15):				
Parents' Drinking Situation	0.1213	0.0499	2.4309	0.108
Friends/fellows' Drinking Situation	0.2433	0.0312	7.8025	0.378
Drinking Situation (0.54):				
Sex	-1.2456	0.0904	-13.774	-0.371
Age	0.0278	0.0036	7.6770	0.206
Parents' Drinking Situation	0.6570	0.2304	2.8517	0.095
Friend/fellows' Drinking Situation	1.3893	0.1587	8.7544	0.350
Drinking Attitudes	1.0010	0.2361	4.2393	0.163
Alcohol-related Problems (0.37):				
Sex	-0.1229	0.0288	-4.2631	-0.139
Parents' Drinking Situation	0.8100	0.1297	6.2478	0.446
Drinking Situation	0.0755	0.0092	8.1940	0.288
Alcohol-related Diseases (0.19):				
Age	0.0094	0.0007	12.5668	0.397
Drinking Situation	0.0165	0.0051	3.2273	0.094

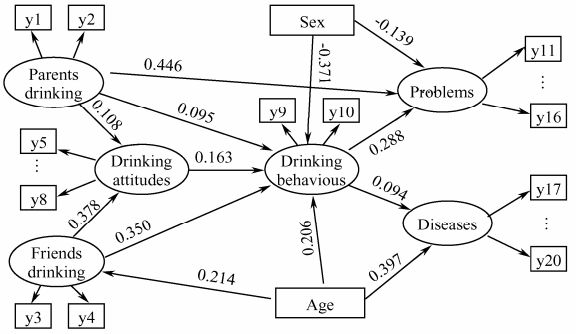

FIG. 1. Path diagram for structural equation model.

Table 4 shows the estimates of standardized total effects between latent variables, in which the total effect was equal to the direct effect plus all indirect effects.

TABLE 4

Estimates of Standardized Total Effects

Dependent Latent Variable	Independent Latent Variable						
	Sex	Age	F1	F2	F3	F4	F5
F1: Parents' Drinking Situation							
F2: Friends/fellows' Drink Situation	0.0	0.214					
F3: Drinking Attitudes	0.0	0.081	0.108	0.378			
F4: Drinking Situation	-0.371	0.362	0.113	0.412	0.163		
F5: Alcohol-related Problems	-0.246	0.104	0.478	0.119	0.047	0.288	
F6: Alcohol-related Diseases	-0.035	0.431	0.011	0.039	0.015	0.094	0.0

DISCUSSION

Wuhan is a metropolitan with a population of 8 millions, located in the central area of China. As it has a cultural tradition of centuries and multitudinous population, Wuhan City can be seen as the epitome of China. Especially, the residents' living habits and practices including drinking behaviors represent truly the most of urban Chinese, notwithstanding there exist somewhat cultural and economic variations across the whole country.

From the present study, it can be seen that drinking alcohol is a popular habit of urban men and women at the modern times in China. Both the frequency of drinking alcohol and the yearly alcohol consumption have been significantly increasing compared with those ten years ago[4,5], and the figures are becoming ever closer to those of other countries in the world. Consequently, the number of alcohol abusers has been rapidly increasing and the alcohol-related health problems represent a serious social concern in China. If the Chinese people remain blind to this situation, the public health will be severely damaged.

What are the main risk factors that cause the alcohol-related health problems and diseases? What are the causal relationships among them? From Fig. 1, it is clear that parents' and friends' or fellows' drinking behaviors as well as the respondents' drinking attitudes directly influenced the respondents' drinking situation. Parents' drinking behaviors and respondents' drinking situation directly impacted the alcohol-related problems, and respondents' drinking situation directly impacted the alcohol-related diseases. Males drank more alcohol and had more alcohol-related problems than females, older drinkers drank more alcohol and had more alcohol-related diseases than young drinkers.

Compared with all influencing factors on the respondents' drinking situation, friends or fellows' drinking behaviors exerted the most significant influence (the standardized coefficient was 0.412), the next were gender and age. Similarly, compared with all influencing factors on the alcohol-related problems, the parents' drinking behavior was one of the most significant factors (the standardized coefficient was 0.478), the next was the respondents' drinking situations (the standardized coefficient was 0.288). Similarly, compared with all influences on the alcohol-related diseases, except age, the respondents' drinking situations was the strongest one (the standardized coefficient was 0.094). These

results indicate that the living environment, hereditary characteristics and drinking behaviors are the main risk factors that strongly impact the alcohol-related health problems. Therefore, restricting drinking habit is beneficial to the offsprings and the whole society. Health education targeting to alcohol drinking behaviors and alcohol-related problems is a very important task for all medical researchers and social workers.

In conclusion, as a preventive strategy, public health workers should pay more attention to the health education about alcohol drinking, especially for women in their early motherhood. An effective preventive intervention could lead to a significant reduction in alcohol abuse and alcohol-related health problems.

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