Published in final edited form as:

AIDS Care. 2017 February ; 29(2): 223–225. doi:10.1080/09540121.2016.1211240.

A Pedigree-based Proxy Measure of Genetic Predisposition of Drinking and Alcohol Use among Female Sex Workers in China: a cross-sectional study

Chen Zhang^{1,*}, Xiaoming Li², Yu Liu¹, Shan Qiao², Shaobing Su³, Liying Zhang⁴, and Yuejiao Zhou⁵

¹Division of Epidemiology, Vanderbilt University, 2525 West End Ave. Suite 725, Nashville, Tennessee, United State of America.

²Department of Health Promotion, Education, and Behavior, Arnold School of Public Health, University of South Carolina, 915 Greene Street, Room 408, Columbia, South Carolina, United State of America.

³Department of Psychology, Tuft University, 490 Boston Ave. Medford, Massachusetts, United State of America.

⁴Department of Pediatrics, Wayne State University, 4707 St. Antoine, Suite W534, Detroit, Michigan, United State of America.

⁵Department of HIV/STD Prevention, Guangxi CDC, Jinzhou Rd., Qingxiu District, Nanning, Guangxi, China.

Abstract

Scientific evidence has suggested that genetic factors accounted for more than half of the vulnerability of developing alcohol use problems. However, collecting genetic data poses a significant challenge for most population-based behavioral studies. The aim of this study was to assess the utilities of a pedigree-based proxy measure of genetic predisposition of drinking (GPD) and its effect on alcohol use behaviors as well as its interactions with personal and environmental factors. In the current study, cross-sectional data were collected from 700 female sex workers (FSW) in Guangxi, China. Participants provided information on a pedigree-based proxy measure of GPD and their alcohol use behaviors. Chi-square and independent t-test was applied for examining the bivariate associations between GPD and alcohol use behaviors; multivariate and ordinal regression models were used to examine the effect of GPD on alcohol use. This study found that women with a higher composite score of GPD tended to have a higher risk of alcohol use problem compared to their counterparts ($p < 0.05$). GPD was a significant predictor of alcohol use problems ($p < 0.05$), especially among women who had mental health issues or lack of health cares. The pedigree-based measure provided a useful proxy of GPD among participants. Both FSW's mental health and health care access interact with GPD, and affect their drinking patterns. By understanding the genetic basis of alcohol use, we can develop scalable and efficacious

*Corresponding author: Chen Zhang: Division of Epidemiology, Vanderbilt University, 2525 West End Ave. Suite 725, Nashville, Tennessee, United State of America. chen.zhang.1@vanderbilt.edu.

interventions that will take into consideration of individual risk profile and environmental influences.

Keywords

Genetic Disposition of Drinking; Female sex workers; China

INTRODUCTION

Alcohol use problem has been considered as a common but etiologically complex issue that is attributable to many individual and environmental factors (WHO, 2014). Scientific evidences have suggested that genetic factors accounted for more than half of the vulnerability of drinking problems (Ducci & Goldman, 2008), and people's alcoholism is significantly associated with drinking problems of their family members sharing similar genotypes (Meyers et al., 2014; Tabakoff et al., 2009). Research has shown conclusively that family history plays a key role in individual's alcoholism (M.-A. Enoch; M. A. Enoch & Goldman, 2001).

Although the evidence of genetic root of alcohol use problem is compelling, collecting actual genetic data presents a significant challenge for many population-based behavioral studies, especially in the low- and middle-income countries. One possible solution to address this challenge is to use a pedigree-based measure as a proxy of GPD, as evidence indicates that biological family members and relatives may share similar genetic factors for alcoholism (M. A. Enoch & Goldman, 2001; Merikangas et al., 1998).

In addition to individual genetic predisposition and biological mechanisms, people's drinking behaviors are also likely to be modified by environmental factors (NIAAA, 2014; Zhang, Hong, et al., 2013; Zhang, Li, Chen, et al., 2013; Zhang et al., 2012), where the synergies gained from the interaction of genetic and environmental factors accounted for a substantial proportion of alcohol use problems (Cadoret, Troughton, & O'Gorman, 1987). Among alcohol users, a few groups are at particularly high risks (ICAP, 2011), including female sex workers (FSW) (Ross, Crisp, Mansson, & Hawkes, 2012). Despite a growing number of studies examining drinking behaviors among FSW, evidence regarding the role of genetic factors in alcohol use among this at-risk population is scarce. Therefore, our study aims to investigate GPD, as well as its interaction with personal (e.g., mental health status) or environmental factors (e.g., access to health care), and how they are associated with FSW's drinking behaviors. We will also assess the utilities of a pedigree-based measure as a proxy for GPD as well as the environment in which the FSW were living.

METHODS

Study design

The data collection procedure has been described elsewhere (Zhang, Li, Chen, et al., 2013; Zhang, Li, Hong, Su, & Zhou, 2013). Briefly, we analyzed data from a cross-sectional study that conducted in two major cities in Guangxi Province in 2008. Among 700 women who provided written consent forms and finished the self-administered survey, 673 (96.1%)

provided complete data relevant to our research questions and were included in the current analysis. The Institute Review Boards at Wayne State University in the United States and Beijing Normal University in China approved the study protocol.

In the current analysis, the exposure variable is GPD, and the outcome variable is alcohol use that measured by AUDIT, intoxication frequency, and days of drinking per week. *Alcohol use behavior* was measured by a validated 10-item Alcohol Use Disorders Identification Test (AUDIT) (Saunders, Aasland, Babor, de la Fuente, & Grant, 1993; WHO, 2001); *frequency of intoxication* was measured by participants' reported frequency of intoxication in the past six months (e.g., never, occasionally, half of the time, most of the time, almost all the time); *drinking days per week* was measured by the number of days participants drank alcohol in a typical week (e.g., 0-7 days). GPD is measured by a pedigree-based proxy indicator by asking participants if any of their blood-related family members and relatives (e.g., parents [first-degree]; siblings, aunts, uncles, and grandparents [second-degree]) were heavy drinkers. Both a composite score and a categorized closeness of the pedigree-based relatives were used in the analysis. *Effect measure modification (EMM)* are used to assess the different effects of exposure-outcome relationships within different levels of another variable (Baron & Kenny, 1986; Rothman, Greenland, & Lash, 2008). Potential EMM in the current study included both mental health issues (e.g., depression, suicide tendency, illegal drug use and smoking) and access to health care.

We employed chi-square and independent t-test to assess bivariate associations of outcome variables and exposure variable. A trend test has been also used to test if any significant trends can be detected across the closeness of relatives. Furthermore, we employed multivariate linear and ordinal regression models to examine associations of alcohol use and GPD by controlling potential confounders. Adjusted odds ratios (aOR) and coefficient (β) from the regression models and their 95% confidence intervals (95% CI) were used to depict the relationships. All statistical analyses were performed using STATA 13.0 (College Station, TX).

RESULTS

The average AUDIT score was 8.4 (SD=6.9) among the 673 included FSW. For FSW having both drinking first and second-degree relatives, they had highest AUDIT score ($p<0.05$). In addition, significant increasing trends of the AUDIT score and intoxication frequency have been observed across the closeness of the pedigree-based relatives (p for trend <0.05).

Women with a higher composite score of GPD tend to have a higher risk of drinking problems compared to their counterparts. GPD was positively associated with a higher AUDIT score no matter whether FSW had regular health check-ups or gynecological exams or not. Similarly, the effect on days of drinking per week was the same among women with or without gynecological check-ups. FSW with mental health problems and who lacked of health care were more likely to report alcohol use problems.

DISCUSSION

Findings in the current study confirm the significant association between GPD and alcohol use among FSW. Furthermore, both FSW's mental health status and access to health care differentiate the relationship between GPD and their drinking patterns. These findings can inform FSW's drinking behaviors closely interact with both personal and environmental factors. Alcohol use risk reduction intervention programs should be incorporated with universal health care programs including both mental and physical health, as drinking problems among women with GPD may be prevented by participating in mental health counselling or having health check-ups. On the other hand, GPD did not interact with some factors related to FSW's mental health or access to health care. In virtue of FSW with GPD are more inclined to develop severe drinking problems during their personal or career life (Kareken et al., 2010; Tabakoff et al., 2009; Zhang, Hong, et al., 2013; Zhang et al., 2012), early detection can initiate prompt interventions and prevent these women from developing alcohol use problems at the initial stage of their sex career.

A few limitations should be considered when interpreting results in the current study. First, although the pedigree-based measure can serve as a proxy for GPD, we did not collect other biological or genetic data related to alcohol use (e.g., biomarkers) to validate this measure. Second, participants were recruited from cities in southeast China. The sample might not be representative of FSW in other areas of China. Third, due to the illegal and highly stigmatized status of sex work in China, our data are subject to socially desirable reporting. The self-reported data may also suffer recall bias.

The current study is the first study to investigate the impact of GPD on FSW's drinking behaviors, and examine its interaction with both women's mental health and access to health care. It also validates the pedigree-based measure as a useful proxy of GPD as well as the interaction with environment in which these participants were living. As no existing studies have directly examined the GPD in Chinese settings yet, we can employ this measure in China as well as other resource-limited settings in future research to explore the role of genetic factors. This study sheds light on research for exploring the associations between genetic predisposition and their risky behaviors among this vulnerable group as well as among general populations in China and other international settings (Roman, Zepeda-Carrillo, Moreno-Luna, & Panduro, 2013).

Acknowledgments

Funding information

The study described in this report was in part supported by NIH Research Grant R01AA018090 by the National Institute for Alcohol Abuse and Alcoholism. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute for Alcohol Abuse and Alcoholism.

REFERENCE

- Baron RM, & Kenny DA (1986). The moderator-mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. *J Pers Soc Psychol*, 51(6), 1173–1182. [PubMed: 3806354]

- Cadoret RJ, Troughton E, & O’Gorman TW (1987). Genetic and environmental factors in alcohol abuse and antisocial personality. *J Stud Alcohol*, 48(1), 1–8. [PubMed: 3821113]
- Ducci F, & Goldman D (2008). Genetic approaches to addiction: genes and alcohol. *Addiction*, 103(9), 1414–1428. doi: 10.1111/j.1360-0443.2008.02203.x [PubMed: 18422824]
- Enoch M-A Genetic Influences on the Development of Alcoholism. *Curr Psychiatry Rep*, 15(11), 412. [PubMed: 24091936]
- Enoch MA, & Goldman D (2001). The genetics of alcoholism and alcohol abuse. *Curr Psychiatry Rep*, 3(2), 144–151. [PubMed: 11276410]
- ICAP. (2011). ICAP Blue Book: Practical guides for alcohol policy and prevention approaches. . “At-risk” Populations.
- Kareken DA, Liang T, Wetherill L, Dziedzic M, Bragulat V, Cox C, . . . Foroud, T. (2010). A polymorphism in GABRA2 is associated with the medial frontal response to alcohol cues in an fMRI study. *Alcohol Clin Exp Res*, 34(12), 2169–2178. doi: 10.1111/j.1530-0277.2010.01293.x [PubMed: 20698837]
- Merikangas KR, Stolar M, Stevens DE, Goulet J, Preisig MA, Fenton B, . . . Rounsaville, B. J. (1998). Familial transmission of substance use disorders. *Arch Gen Psychiatry*, 55(11), 973–979. [PubMed: 9819065]
- NIAAA. (2014). Genetics of Alcohol Use Disorders. Retrieved Aug 8, 2014, 2014, from <http://www.niaaa.nih.gov/alcohol-health/overview-alcohol-consumption/alcohol-use-disorders/genetics-alcohol-use-disorders>
- Roman S, Zepeda-Carrillo EA, Moreno-Luna LE, & Panduro A (2013). Alcoholism and liver disease in Mexico: genetic and environmental factors. *World J Gastroenterol*, 19(44), 7972–7982. doi: 10.3748/wjg.v19.i44.7972 [PubMed: 24307790]
- Ross MW, Crisp BR, Mansson SA, & Hawkes S (2012). Occupational health and safety among commercial sex workers. *Scand J Work Environ Health*, 38(2), 105–119. doi: 10.5271/sjweh.3184 [PubMed: 21808944]
- Rothman K, Greenland S, & Lash T (2008). *Modern Epidemiology*. Philadelphia, PA: Lippincott, Williams & Wilkins.
- Saunders JB, Aasland OG, Babor TF, de la Fuente JR, & Grant M (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(6), 791–804. [PubMed: 8329970]
- Tabakoff B, Saba L, Printz M, Flodman P, Hodgkinson C, Goldman D, . . . Hoffman PL. (2009). Genetical genomic determinants of alcohol consumption in rats and humans. *BMC Biol*, 7, 70. doi: 10.1186/1741-7007-7-70 [PubMed: 19874574]
- WHO. (2001). AUDIT: guidance for use in primary care.
- WHO. (2014). *Global status report on alcohol and health – 2014 ed*. Geneva, Switzerland: WHO Press Retrieved from http://apps.who.int/iris/bitstream/10665/112736/1/9789240692763_eng.pdf?ua=1.
- Zhang C, Hong Y, Li X, Qiao S, Zhou Y, & Su S (2013). Psychological Stressors in the Context of Commercial Sex Among Female Sex Workers in China. *Health Care Women Int*. doi: 10.1080/07399332.2013.838247
- Zhang C, Li X, Chen Y, Hong Y, Qiao S, Liu W, & Zhou Y (2013). Alcohol and Other Drug Use, Partner Violence, and Mental Health Problems Among Female Sex Workers in Southwest China. *Health Care Women Int*. doi: DOI:10.1080/07399332.2012.757317
- Zhang C, Li X, Hong Y, Stanton B, Chen Y, Zhou Y, & Liu W (2012). Pro-alcohol-use social environment and alcohol use among female sex workers in China: beyond the effects of serving alcohol. *World Health Popul*, 13(4), 15–27. [PubMed: 23089725]
- Zhang C, Li X, Hong Y, Su S, & Zhou Y (2013). Relationship between female sex workers and gatekeeper: The impact on female sex worker’s mental health in China. *Psychol Health Med*. doi: 10.1080/13548506.2013.869612