Research Article

Tobacco and Alcohol Use in Muslims Compared with Local Han Population in Mainland China

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Abstract

Objectives: The tobacco and alcohol use is a serious public health problem in developing countries. The present study seeks to explore the prevalence of tobacco and alcohol use in a Chinese Muslim population compared with a local non-Muslim Chinese Han population.

Study Design: A cross-sectional study design applied.

Methods: Face-to-face interviews were conducted in 6476 participants systematically sampled from the Ningxia province of western China (where over one third of the total population was Muslim). The Chinese version of the Composite International Diagnostic Interview (CIDI) was used to evaluate tobacco and alcohol use disorders. Logistic regression was used to compare prevalence of disorders between Muslim and Han populations.

Results: A total of 5811 participants completed the study. The overall prevalence of current smoking was 19.2%, with 1.8% of participants being tobacco dependent. The prevalence of current alcohol use was 5.8%, with 2.6% having alcohol use disorders. The Muslims had a lower risk of tobacco use than Han (for current smoking OR=0.41, P<0.001; for tobacco dependence OR=0.71, P<0.05). The same was true for alcohol use (for current drinking OR=0.29, P<0.001; for alcohol use disorders OR=0.63, P<0.05).

Conclusions: Muslims have a lower risk of tobacco and alcohol use and use disorders than the majority Han population in western China, the Islamic culture may possibly protect people from harmful tobacco and alcohol use even under Non-Muslim countries like China.

**Keywords:** Tobacco use; Alcohol use; Muslims; Mainland China; Cross-sectional study

Introduction

Tobacco and alcohol use pose significant public health challenges and are the leading causes of preventable morbidity and mortality worldwide [1,2]. Combined tobacco and alcohol related illnesses are estimated to account for 12.5% of all deaths globally [1]. China has the largest population of smokers in the world, with over 350 million current smokers in 2012 [3]. More than 50% of males over the age of 15 smoke cigarettes in China [4]. In addition, due to failed efforts to reduce or ban smoking in public places, many non-smokers (the majority being children and women) also experience health problems from second hand smoke exposure [5,6]. The number of deaths attributed to tobacco use has now reached 1.2 million per year in China, and the death toll is predicted to increase to 2 million in the near future if effective efforts to reduce smoking are not instituted [7]. The alcohol use disorders have also become a problem in China, where these disorders have been increasing over time. The prevalence of alcohol use disorders in mainland China was estimated to range from 4.7% to 15.4% [8], and account for 11.7% of the total burden of disease attributed to mental and behavioral disorders according to 2010 Global Burden of Disease [9]. Tobacco and alcohol related behaviors are known to be strongly influenced by social, cultural and environmental factors [10].

All major world religions place a high value on human life, and for that reason often discourage cigarette smoking and excessive alcohol use, even though they may not prohibit them entirely [11]. Consequently, religious involvement is known to be an important predictor of healthy behaviors and substance use [12-14]. At least one study has found that a higher frequency of religious attendance predicts a lower probability of both current smoking and smoking initiation among individuals between ages 20 and 32 [15].

Islam teaches that whatever damages the body or mind must be abstained from. In fact, a "fatwa" (religious ruling not specifically based on the Qur'an but felt by religious scholars to be warranted based on the particular situation) has now banned cigarette smoking in Muslims [16,17]. Studies on smokers' perception of the role of religion have found that religion can be a culturally relevant vehicle to complement other tobacco control efforts in Muslim societies [18]. Most Islamic scholars agree that the Qur'an clearly prohibits alcohol use. As a result, the prevalence of tobacco and alcohol use is much lower in Muslim countries than in non-Muslim countries [19]. Much less clear is the status of tobacco and alcohol use in Muslims living in Non-Muslim countries, where religion is not as central to people's lives.

For instance, over 130 million Muslims live in China, those

Figure 1: Identification of study participants.
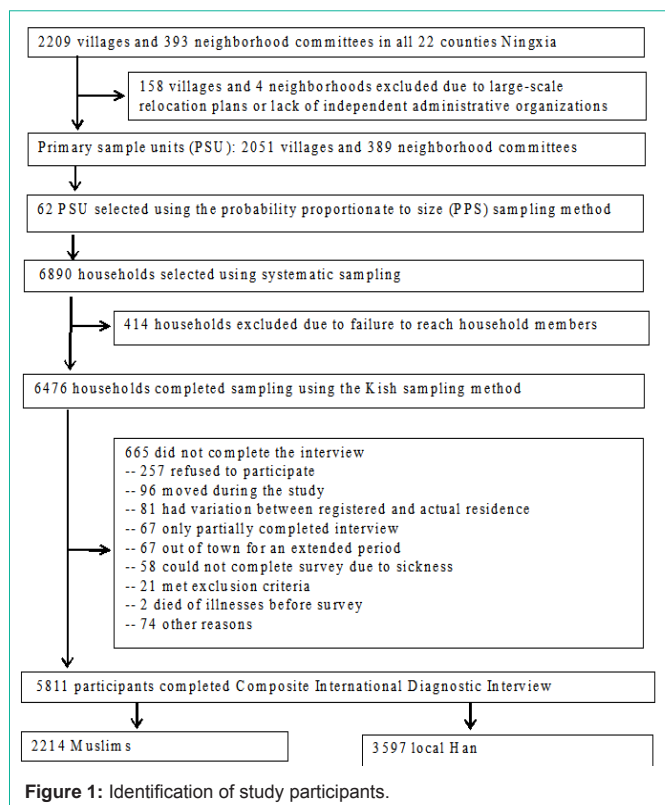
Muslim minorities share a common cultural heritage with their compatriots of other faiths, they face challenges being a numerically and politically significant minority in twenty first century China. The province of Ningxia is in western China, where over one-third of the population is of Hui ethnicity. The Hui are a minority group in China who has largely descended from those who came to China from Saudi Arabia. Consequently, this ethnic group is composed almost entirely of Muslims [20,21]. Our early paper reported on the association between religiosity and cigarette smoking in this sample, showing that Muslims were less likely to smoke than non-Muslims, and that higher religiosity was inversely associated with current smoking in Muslim [22]. There is no study reported the prevalence of tobacco and alcohol use disorders in those Muslims living in mainland China. The current study focus on the difference of prevalence of tobacco and alcohol use between Muslim population and local Han Chinese in western China and hypothesized that the Islamic culture have positive influence on the smoking and drinking behaviors in those Muslims living in Non-Muslim countries, even those local Han Chinese possibly may benefit from the Islamic culture.

Methods

Participants

Data for this study are drawn from an epidemiological survey of mental disorders in the province of Ningxia (ESMD-NX). This study targeted urban and rural dwellers who met the following criteria: age 18 years or older, residence for at least six months or longer at the current address, not having significant impairment caused by brain injury, brain tumor and/or craniotomy or dementia, not being in the acute phase of a stroke or any severe medical illness, not having any obvious cognitive disabilities or the presence of deafness, aphasia or other language barriers; and not living in an institution such as a military camp, nursing home, etc.

Sampling method

As Figure 1 shows, subject recruitment in the ESMD-NX study involved a multi-stage sampling process to select participants across the province of Ningxia. First, according to China's household registration management policy, the primary community in urban is neighborhood committees (NC, jumin weiyuanhui) , and resident groups (RG, jumin xiaozu) for rural areas, two levels were designated as primary sampling units (PSUs). According to the Ningxia statistics yearbook 2010, excluded were RG where urban construction was planned in the near future that had no independent administrative settings. Consequently, a PSU list was created with totally 2,209 RG and 393 NC. In the second stage, depend on the initial desired sample size that determined to be 62 PSUs were selected using a Probability Proportionate to Size (PPS) method [23]. Next, a household list with physical addresses was obtained from the local household registration system, theoretically, the list contains all the possible addresses. Third, depending on the total number of households in the selected PSUs, 60 to 210 households were systematically identified from each PSUs resulting in a total of 6,890 households being selected. Finally, trained lay interviewers visited sampled households and used a Kish selection table using a computer program [24] to identify one eligible participant from each household. As a result, 6,476 participants were approached in order to conduct a face-to-face interview. A total of 5811 completed the interview and represent the sample for this study.

A computer-assisted version of the interviewer-administrated Chinese-language edition of the Composite International Diagnostic Interview was used (CIDI-CAPI) [25]. The face-to-face computer assisted interviews (CAPI) were administered by lay interviewers from July 2011 to January 2013. Students from Ningxia Medical University were used as interviewers after completing a 7-day course that involved training in basic interviewing techniques, administration of the questionnaire, operation of the computer-assisted system, post-interview editing, and in- and out-of-classroom exercises. Ninety trainees passed the final exam that qualified them as interviewers (41 males, 49 female). The interviewers entered each sampled PSU in small groups, led by field supervisors and assisted by primary health care providers. If the designated respondent was not available, the interviewer would make an appointment with a member of the household for a later visit. If no one was at home, the interviewer visited the residence at another time, over three times cannot reach the participants will regard as loss response.

The survey was anonymous in that no identifying information was collected such as name, government security number, identification card number, etc. The potential risks and benefits of the survey were explained to participants who were asked to provide consent by checking a box on computer screen. If the box checked was "I do not agree," the CAPI program was immediately terminated. The institutional review board of the Ningxia Medical University (2014167) approved the study.

Measures

Mental disorders: The Composite International Diagnostic

Table 1: Characteristics of the sample.

	Total N =5811	Muslim N =2214	Han N =3597
Demographics			
Age, years, mean(sd)	44.6 (15.6)	41.5 (15.0)	46.4 (15.7) ‡
Education, years, mean(sd)	6.1 (5.1)	4.8 (4.7)	6.9 (5.1) ‡
Gender, male,% (n)	40.8 (2,372)	41.2 (913)	40.5 (1,459)
Marriage, married, % (n)	88.1 (5,122)	90.1 (1,996)	86.9 (3,126)†
Region, developing, % (n)	36.9 (2,147)	47.3 (1,048)	30.5 (1,099)‡
Migrant, yes, % (n)	29.7 (1,726)	44.4 (984)	20.6 (742)‡
Urban/rural, rural, % (n)	71.8 (4,175)	82.6 (1,830)	65.1 (2,345)‡
Physical health			
Overall physical health, poor, % (n)	47.4 (2,757)	45.3 (1,005)	48.7 (1,752)*
Type II diabetes, yes, % (n)	3.2 (187)	2.5 (57)	3.6 (130)*
Hypertension, yes, % (n)	13.3 (774)	10.0 (223)	9.4 (551)‡
Physical pain, yes, % (n)	44.0 (2,561)	49.2 (1,090)	40.9 (1,471)‡
Mental disorders			
Anxiety disorders, yes, % (n)	6.3 (371)	7.6 (170)	5.5 (201)†
Mood disorders, yes, % (n)	19.5 (1,138)	22.4 (496)	17.8 (642)‡
Substance use			
Current smoking, yes, % (n)	19.1 (1,113)	13.9 (308)	22.3 (805)‡
Tobacco dependence, yes, % (n)	4.8 (284)	4.2 (93)	5.3 (191)
Current drinking, yes, % (n)	5.7 (336)	2.2 (50)	7.9 (286)‡
Alcohol use disorder, yes, % (n)	2.6 (153)	1.7 (39)	3.1 (114)†

*P<0.05; †P<0.01; ‡P<0.001

Interview 3.0 (CIDI3.0) computer assisted Chinese version [26] was used to assess common mental disorders. Culture adaptation and modification research found it was a good instruction in validation [27]. High concordance was found between the clinical evaluation for mental disorder and the Chinese version CIDI diagnoses [28] and consequently has been widely used in epidemiological studies in China [29,30]. Twelve-month prevalence of mental disorders (anxiety disorders including agoraphobia, generalized anxiety disorder, obsessive-compulsive disorder, panic disorder, social phobia, specific phobia, and neurasthenia; mood disorders including unipolar depressive disorder and bipolar disorder; substance use disorders including alcohol abuse, alcohol dependence and tobacco dependence) was assessed.

Alcohol use: The CIDI assessed alcohol use in terms of (1) current drinking (at least once a month in the past twelve months), (2) alcohol use disorders (alcohol abuse/ alcohol dependent), (3) age of drinking onset, and (4) amount of alcohol consumed. Alcohol consumption was measured using a standard drinking cup that contained 10 grams of pure alcohol, which was determined which interviewers comparing amount consumed to a list of alcoholic drinks and average alcohol content.

Tobacco use: The CIDI assessed tobacco use in terms of (1) current smoking (two months when smoked at least once per week), (2) tobacco dependence, (3) smoking age of onset (age when began smoking at least once a week), and (4) cigarette consumption (cigarettes smoked every day in the past twelve months).

General demographics assessed were age, gender, years of education, ethnicity, marital status, household registration, migration experience from another province in China. Physical health characteristics assessed were self-reported type II diabetes (yes *vs* no), hypertension (yes *vs* no), and physical pain (any *vs* none).

Statistical analyses

Statistical analyses were performed using SAS 8.2 Statistics Software (SAS Institute Inc., Durham, NC, USA). Differences between Muslims and Han in terms of demographics, physical health, mental disorder, and substance use were examined using Student's t-test for continuous variables and the chi-square statistic for categorical variables. Three separate logistic regression models (Model l=group; Model 2=Model l + demographics; Model 3= Model 2 + physical health + mental disorders) were constructed to assess the risk of tobacco and alcohol use between groups. The dependent variables were smoking status (1=yes, 0=no) and drinking status (1=yes, 0=no). Independent variables were gender (1=female, 0=male), ethnicity (1=Muslims, 0=Han), age, marital status (1=married, 0=unmarried), education (1=illiterate, 2=elementary, 3 =junior high school, 4=high school and the above), immigration status (1=yes, 0=no), urban/rural residence (1=rural, 0=urban), region (1=developing, 0=developed), type II diabetes (1=yes, 0=no), hypertension (1=yes, 0=no), self-assessed physical health (1=poor, 0=good), presence of physical pain (1=yes, 0=no), anxiety disorder (1=yes, 0=no), and mood disorder (1=yes, 0=no). Significance level was set at 0.05 and two-tailed tests were used.

Results

Sample characteristics

Demographics of the sample are presented in Table 1. The final sample consisted of 5,811 participants (38.1% Muslim, 61.9% Han). About one fifth was current smokers and 5.7% were current drinkers. Compared to participants of Han ethnicity, Muslims were younger, had less education (<0.001), reported poorer physical health, more anxiety disorders, mood disorder, and physical pain (P<0.001). In addition, Muslims were less likely than Han to smoke, drink alcohol, have alcohol use disorders (P<0.01).

Prevalence of tobacco and alcohol use

As Table 2 indicates, stratifying analyses by gender produced the following findings. Muslims had a significantly lower prevalence of current smoking and alcohol use than the local Han majority in both males and females (smoking in males: 33.1% *vs* 51.9%; alcohol use in males: 4.7% *vs* 17.3%; smoking in females: 0.3% *vs* 2.2%; alcohol use in females: 0.5% *vs* 1.5%), and also had a lower prevalence of alcohol use disorders than Han in males (4.0% *vs* 7.4%) (although no difference in females).

Age of onset

As indicated in Table 3, there was also a significant difference between Muslims and Han in terms of age of onset for smoking in males (P<0.001).Muslims began smoking at a younger age than Han, and smoked more cigarettes each day during the past 12 months than did Han. There was no difference between the Muslims and Han in the age of onset for drinking in males or females, although alcohol consumption per day in males who drank was greater in Muslims than in Han (P<0.01).

Table 2: Prevalence of tobacco and alcohol use in Muslims compared with local Han.

	Male		Chi^2	Female		Chi^2
	Muslim N=913	Han N= 1459		Muslim N=1301	Han N=2138	
Current smoking, yes, % (n)	33.1(303)	51.9 (758)‡	79.9	0.3 (5)	2.2 (47)‡	17.8
Tobacco dependence, yes, % (n)	9.9 (91)	12.4 (181)	3.29	0.1 (2)	0.4 (10)	2.29
Current drinking, yes, % (n)	4.7 (43)	17.3 (253)‡	82.0	0.5 (7)	1.5 (33)†	7.11
Alcohol use disorder, yes, % (n)	4.0 (37)	7.4 (109)‡	11.3	0.1 (2)	0.2 (5)	0.26

†$P<0.01$; ‡$P<0.001$

Table 3: Prevalence of tobacco and alcohol use in Muslims compared with local Han.

	Male		F/Z	Female		F/Z
	Muslim	Han		Muslim	Han	
Onset age of smoking, year, mean (SD)	19.6 (5.6) N=371	21.9(7.3)‡ N=912	27.68	23.6(13.3) N=6	34.4(12.9) N=64	3.78
Cigarette consumption per day, stick, M (Q1,Q3)	20.0 (10.0, 20.0) N=303	15.0 (7.0, 20.0) N=723	1.40	9.0(6.0, 35.0) N=4	10.0(6.0, 20.0) N=40	0.10
Onset age of drinking, year, mean (SD)	21.7 (8.4) N=225	20.9 (6.9) N=931	2.51	22.1(6.3) N=74	25.0 (9.8)* N=591	6.19
Alcohol consumption per day, SC, M (Q1,Q3)	5.0(1.0, 10.0) N=106	2(1.0, 6.0)† N=491	2.61	1.5(1.0, 3.5) N=16	2(1.0, 4.0) N=97	0.37

M: median; Q1: Lower quartile; Q3: Upper quartile
SC: standard cup
*$P<0.05$; †$P<0.01$

Multivariate analyses

Multivariate analyses comparing tobacco and alcohol use in Muslims *vs* local Han are presented in Table 4. Muslims were at significantly lower risk of current smoking, current alcohol use, tobacco dependence, and alcohol use disorder after controlling for demographic variables (Model 2). The difference persisted when controlling for physical and mental health (Model 3).

Discussion

Tobacco and alcohol use present a great challenge to the public health departments of the world [31]. Behaviors of tobacco and alcohol use under the influence of religion have been a growing concern. We found from the study results that Muslims had significantly lower prevalence of current smoking and drinking than the local Han people in both males and females, lower prevalence of alcohol use disorders than the local Han population in males (4.0% *vs* 7.4%), which were consistent with study results in Muslim countries outside China [32]. Further analysis demonstrated that the prevalence of current smoking and drinking (19.1% and 5.7% respectively) in Ningxia adults composed of 38.1% Muslims and 61.9% local Han people were lower than that of general population in China and Kunming province which has the same economic level with Ningxia [33].

It is well known that healthy and balanced ways of life are advocated and valued in Islamism like other mainstream religious beliefs. Initially it might seem that there could be no questions about correct behavior for Muslims with regard to alcohol, because drinking is forbidden in Islam. However, alcohol and tobacco-related situations arise often in modern life and can be ambiguous in settings in which Muslims live as a minority group [34]. Muslim is minor group living in China which Han people is major group blended with many more other minor groups. The present study found a lower prevalence of current smoking, drinking and alcohol use disorders in Muslims than local majorities, indicated that Muslims still could

Table 4: Odds ratio of tobacco and alcohol use in Muslims compared with local Han (N=5,811).

Variables	Model 1 OR (95%CI)	Model 2 OR (95%CI)	Model 3 OR (95%CI)
Current smoking	0.56 (0.48-0.64)‡	0.43 (0.36-0.51)‡	0.41(0.34-0.50)‡
R-square	0.01	0.29	0.29
Tobacco dependence	0.63 (0.48-0.83)†	0.74 (0.56-0.97)*	0.71(0.53-0.94)*
R-square	0.12	0.07	0.07
Current drinking	0.26 (0.19-0.35)‡	0.29 (0.21-0.40)‡	0.29 (0.21-0.40)‡
R-square	0.01	0.09	0.09
Alcohol use disorder	0.45 (0.30-0.65)‡	0.65 (0.44-0.96)*	0.63 (0.42-0.93)*
R-square	0.06	0.04	0.04

OR: Odds Ratio
95% CI: 95% confidence interval
Model l=group; Model 2=Model l + demographics; Model 3= Model 2 + physical health + mental disorders;
*$P<0.05$; †$P<0.01$; ‡$P<0.00$;

regulate behaviors themselves in the settings where of Islamic religious beliefs blending with other cultures. Even more, in such background of cultural blending local Han people living in Ningxia also would be influenced under Islamic beliefs. The lower prevalence of current smoking, drinking and alcohol use disorders in local Han people may be related with Muslim culture. It indicated that cultural influence should be considered in policy-making of tobacco and alcohol control in some region of the China. Also, those findings indicated that the Islamic culture may possibly protect people from harmful tobacco and alcohol use even under Non-Muslim countries like China, where religion was not the central of people's life.

The study results showed that males were the major population using tobacco and alcohol compared with females, which was consistent with most study researches [35]. It is more likely to reduce levels of psychological stress and anxiety by smoking and drinking for males when they undertook much more social duties and felt increasing pressure, while it is more common for females to relieve

pressure or anxiety through crying or shouting. It indicated that males were more likely exposed to smoking/drinking-related hazard, which suggested we should put more attention on males in tobacco/alcohol control campaign.

Females with smoking/drinking problems were increasing in recent years. It was found that a few of females were with smoking/drinking problems although the prevalence of smoking and drinking in females of Muslim and local Han people was lower than that of males. Some researchers found that increasing number of females were exposed to second-hand smoking or passive drinking [36]. Fewer females are inclined to refuse when exposed to such second-hand smoking or passive drinking environment. Recent years females felt higher level of social pressure from child-raising, doing homework and working. Some of them reduce psychological pressure by smoking and drinking. Smoking and drinking is not only harmful to women themselves, but also put children in danger of smoking or drinking related-hazard [37]. Females should be educated the hazard of being exposed to second-hand smoking/passive drinking and learn refusal techniques. It suggested that we should pay more attention to smoking/drinking problems in females.

Taking into account differences in the demographics factors, physical and mental health status between Muslims and local Han people, factors which would had influence on the prevalence of smoking and drinking had been put into analysis in logistic regression model. We knew from results of logistic regression model that Muslims had significantly lower risk in the prevalence of current smoking and drinking, tobacco dependence as well as alcohol use disorders, which was independent of demographics factors (gender, ethnicity, age, marriage, literacy, whether immigration, living status), physical and mental health. It indicated that the Muslims in China were unlikely to use tobacco/alcohol although they had more problems in physical health, mental health and life pressure. Compared with local Han people, more Muslims were migrants, lived in rural and developing area of Ningxia. Research studies confirmed that migrants living economically under-developed rural area encountered higher life pressure and had higher level psychological stress for they had no more resources to control than before when immigrated from original familiar residence to strange living area [38]. More Muslims reported they had more problems in physical health (higher prevalence of hypertension and physical pain) and mental health (higher prevalence of anxiety disorder and mood disorder) than the local Han people. All of which would make individuals, especially males, choose smoking and/or drinking to ease and comfort themselves while they experienced pressure from health and life. However, the Muslims still could regulate behaviors themselves under the influence of Islamic religious beliefs. It was reported that in Muslims the behaviors of using tobacco and alcohol were negatively correlated with involvement of the religious activities [39]. It is necessary to explore to what extent of the impact of Muslim culture on the smoking and drinking consumption of the residents in future research.

However, as males were major population of smoking in the study, it was found there were no significantly difference in prevalence of tobacco dependence in males between the Muslims and the local Han population although the prevalence of current smoking in Muslims was significantly lower than that of the local Han population. Of those smokers and drinkers, the Muslims began smoking earlier and consumed much more cigarettes per day than the local Han population from results of the study, which indicated that it was very easy for some Muslims to develop dependence on tobacco when they smoke longer time and much more cigarettes. The study also found the Muslim males drunk heavier and the Muslim females started drinking earlier than the local Han people even though the tendency of prevalence of alcohol use disorders in Muslim male and female was contrary when compared with the local Han population respectively. Muslims in the study were younger and received less education, made them unknowledgeable to and neglect the harm correlated with excessive smoking and heavier drinking. Individuals with higher levels of education may have more strategies to cope with problems in life other than through using addictive substances, like smoking and drinking [40]. The Muslims may need to be educated with the knowledge of smoking/drinking related harm and related strategies to deal with relevant problems in the smoking/drinking control campaign. To know the reason why some Muslims showed excessive and early smoking/drinking, it is also necessary to explore the impact of family parenting attitude on individual smoking/drinking behavior in Muslim cultures in future research.

Limitations

The present study was the first to examine tobacco/alcohol use in a systematically identified sample of Muslims in China. The study, however, had several limitations that influence the generalizability of the findings and their interpretation. First, the sample was acquired from a province with one of the highest proportion of Muslims in China. Therefore, the findings should be generalized with caution to other regions of this country. In addition, this study did not measure or examine the impact of different occupations and family income on smoking and drinking rates. Furthermore, due to the low prevalence of smoking and drinking among women in this sample, there was little power to examine the influence of demographic, social, mental, and physical factors in this group. Finally, as with any study based on subjective self-report, there is the potential for recall bias that may have affected the accuracy of the data reported.

Conclusions

The prevalence of cigarette smoking and alcohol use and misuse in Muslims living in the Ningxia province of western China was significantly lower than in the local majority Han population. These findings suggest that because of religious beliefs and cultural factors, Muslims – despite their underprivileged minority status, may be able to avoid smoking and alcohol use, which may significantly impact their future health and well-being.

Contributors

Pan SJ and Wang LQ draft the manuscript, and Pan SJ edited the text. Wang ZZ and Koenig HK designed the study and conducted the statistical analysis. All authors contributed to and have approved the final manuscript.

Conflicts of Interest

None of the authors have any conflicts of interest. All authors contributed to and have approved the final manuscript.

Availability of Data and Materials

The datasets supporting the conclusions of this article can be available from the principal investigator, whose email address is wzhzh_lion@126.com.

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